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Overweight and Obesity in Persons Living with HIV: Stigma and Health

Dominica B. Hernandez
University of Connecticut - Storrs, dominica.hernandez@uconn.edu

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In the U.S., there has been an increase in the prevalence of overweight and obesity among people living with HIV (PLWH). Due to a compromised immune system, PLWH contend many life-threating diseases and the presence of dual diseases (i.e., HIV and obesity) can be detrimental to this population. Both obesity and HIV are highly stigmatized diseases; however, little is known about the psychological experience of individuals at the intersection of these two conditions. Given that wasting is the stereotypic phenotype of HIV, it may be that a heavier body weight actually serves as a protective factor against experiencing HIV stigma. Consequently, the meaning and psychological impact of overweight and obesity among individuals with HIV may differ than in the general population. This cross-sectional study examined whether PLWH with overweight or obesity endorsed and experienced less anticipated and enacted stigma due to their weight status. PLWH (n = 671; 428 male and 196 females) were recruited from a holiday donation center in Atlanta, Georgia. Self-reports of medical history, HIV and weight stigma, body image, perceptions of weight status, and nutritional intake were collected via an audio computer assisted self-interview program (ACASI) and weight and height data were measured using a bioelectrical impedance scale. Body weight and height were collected on 624 PLWH (428M, 196F); 26.8% of the sample were overweight (BMI $\geq$25-25.9 kg/m^2) and 32.4% were obese (BMI $\geq$30 kg/m^2), with higher rates of obesity in women (53.6%) than men (22.7%) and higher rates of overweight in men (28.5%) than women (23%). Men and women reported consuming less fruits and vegetables and fiber (g) than national recommendations. No differences were seen in levels of anticipated or enacted stigma due to HIV diagnosis across

weight categories (i.e., underweight, ideal, overweight, and obese). Body image across weight categories was also relatively equal, with over 69% reporting no concerns with their shape. Post hoc analyses displayed a meditational effect of body image on internalized HIV stigma and BMI. As internalized HIV stigma increased so did body image, resulting in a higher BMI. BMI also served as a moderator on body image and internalized weight stigma, as body image increased so did internalized stigma; however, it increased more for persons with a BMI $\leq$ 24.9. Differences were also seen in perceptions of weight status, with individuals that were overweight or obese perceiving himself or herself to be slightly underweight or about the right weight. Additionally, persons that perceived themselves to be slightly overweight or very overweight had a poorer body image relative to those that perceived themselves to be very underweight. Results suggests there were no differences in anticipated or experienced HIV stigma as a result of weight status; however, internalized stigma was closely related to body image and may be more a driving force behind negative feelings held for oneself due to HIV diagnosis. Overweight and obesity were the norm in this sample as well as poor dietary quality, emphasizing the need for weight management interventions that are sensitive to the unique challenges of PLWH.

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Dominica Blanca Lawrence

A.A., Cerritos College, 2005

B.A., University of Southern California, 2007

M.A., Columbia University, 2009

M.A., University of Connecticut, 2013

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Presented by

Dominica Blanca Lawrence, M.A.

Major Advisor _____
Amy Gorin

Associate Advisor _____
Seth Kalichman

Associate Advisor _____
Dean Cruess

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Obesity in Persons Living with HIV: Stigma and Health

Although typically not considered related, both obesity and HIV continue to be problematic health circumstances in the United Sates (Ogden, Carroll, Kit, & Flegal, 2014) and worldwide (World Health Organization, 2015). Though Mexico has recently passed the U.S. in prevalence of obesity, the U.S. remains second in the world in the proportion of people suffering from this pandemic (United Nations, 2009). In the U.S., almost 70% of adults over the age of 20 are overweight [body mass index (BMI) $\geq$25 kg/m^2], with obesity prevalence (BMI $\geq$30 kg/m^2) reaching 34.9% (Ogden et al., 2014). Following the national trend, there has also been a rise in the prevalence of overweight and obesity among persons living with HIV (PLWH) (Boodram et al., 2009; Crum-Cianflone et al., 2010; Crum-Cianflone, Tejidor, Medina, Barahona, & Ganesan, 2008; Hendricks, Willis, Houser, & Jones, 2006; Kruzich, Marquis, Wilson, & Stephensen, 2004; Nagelkerke, Bernsen, Sgaier, & Jha, 2006). Cross-sectional studies have found the prevalence of obesity to be as high as 29% in women and 13% in men (Hendricks et al., 2006), with the prevalence of overweight reaching 40% in both men and women (Crum-Cianflone et al., 2010). One prospective study found that over an 11 year period, 72% of PLWH gained weight, with 80% continuing to gain weight if they were found to be overweight on their last visit (Crum-Cianflone et al., 2008). This increase in overweight and obesity in PLWH is accounted for in part by the increased life expectancy of those with this disease. Through advances of antiretroviral medications and treatment of associated conditions (Moore & Chaisson, 1999; Sabin, 2009), the estimated life expectancy of people with HIV is approaching that of people uninfected by HIV, (HIV, 2008) allowing PLWH to develop comorbid chronic conditions such as obesity.

Understanding this intersection of being overweight or obese and having HIV is critically important because excessive body weight can both compound existing health circumstances in this vulnerable population and introduce new health risks. Initial evidence suggests that obesity has the potential to blunt the effects of antiretroviral medication in the treatment of HIV and decrease CD4 T cell counts (Crum-Cianflone et al., 2010). In addition, obesity brings its own risks such as metabolic syndrome (De Socio, Ricci, Bonfanti, Quirino, & Schillaci, 2010), diabetes (Howard et al., 2005), increased visceral fat (Albu et al., 2007), neurocognitive disorders (Cukierman-Yaffe et al., 2008), psychological distress (Simon et al., 2006) and other health complications. Recent analyses have shown obesity to be associated with an increase in multimorbidity (i.e., the presence of more than one disease) in PLWH, where there was a 15% increase in risk of multimorbidity for those with obesity over those that were identified as underweight (Kim et al., 2012).

While increased life expectancy due to advances in HIV treatment creates the window in which obesity can develop, poor nutritional dispositions are likely a causal factor in the rise of obesity in PLWH and may further complicate health status. Both dietary quantity (i.e., excessive daily caloric intake) and quality (i.e., failing to meet nutritional standards) are important to consider. Maintaining good nutrition is essential to facilitate the body in processing antiretroviral medications and poor nutrition may further weaken the immune system in PLWH (Centers for Disease Control and Prevention, 2011). WHO dietary guidelines recommend a 10% increase in daily energy intake (i.e., caloric consumption) for non-symptomatic adult PLWH and a 20-30% increase for those with symptomatic HIV (World Health Organization, 2013); however, WHO based these initial guidelines prior to an increase in the prevalence of overweight and obesity in order to combat wasting and weight loss. These guidelines do not take into account an

individual's current weight status and thus may inadvertently contribute to excessive weight gain. Healthy nutrition can also help prevent other complications associated with HIV/AIDS, such as bone loss and cancer (Highleyman, 2006). More research is needed to document the dietary intakes of PLWH and how dietary quantity and quality relates to weight status.

Developing effective weight management interventions that reach PLWH who are overweight and obese is a clear health care need; this study explores the unique facets of the intersection of HIV and obesity that may impact the experience of these comorbid conditions and ultimately influence engagement in weight management in PLWH, namely nutritional intake, the stigma associated with HIV and obesity, and body image.

Stigma in PLWH

HIV is a highly stigmatized medical condition that has been well documented throughout the history of this disease (Lentine, Hersey, & Iannacchione, 2000; Radcliffe, Neaigus, Bernard, & Shepard, 2015; Rivera et al., 2015; R. Smith, Rossetto, & Peterson, 2008) and has been associated with poorer health outcomes (Logie & Gadalla, 2009) depression, (Logie & Gadalla, 2009; Lowther, Selman, Harding, & Higginson, 2014) and incomplete medication adherence (Katz et al., 2013; Richter et al., 2014). In the early years of the HIV epidemic wasting became a symbolic physical characteristic of HIV/AIDS and many HIV/AIDS related health campaigns often depicted a PLWH as such. Given the association of wasting and its historical depiction of an advancing HIV disease as well as its symbolic value (i.e., being HIV positive), it is plausible that some PLWH may be motivated to maintain a heavier weight as being overweight or obese may offer a protective value against the isolation and rejection associated with HIV stigma (Earnshaw, Smith, Chaudoir, Amico, & Copenhaver, 2013; Lentine et al., 2000; Mahajan et al., 2008; Radcliffe et al., 2015; Rivera et al., 2015; R. Smith et al., 2008) as well as erroneously

providing an individual with *physical* evidence that they are healthy. Overweight and obesity, though traditionally stigmatizing conditions themselves (Carels et al., 2012; 2009; Pearl, Puhl, & Brownell, 2012; Puhl & Heuer, 2010; Puhl, Moss-Racusin, Schwartz, & Brownell, 2007; Puhl & Brownell, 2001; Sikorski et al., 2011), may serve as beneficial psychological functions for PLWH because they mask the more commonly associated physical symptoms of HIV. Thus, while PLWH who are overweight or obese may experience obesity stigma, the stigma may not be associated with the negative psychological and physical health consequences typically observed in persons with overweight and obesity (Carels et al., 2009; Hunger & Major, 2014; Puhl & Heuer, 2010; Puhl & Brownell, 2001; Sikorski et al., 2011). Because of the proposed protective effect of obesity in PLWH, it is then hypothesized that stigma processes associated with HIV may interfere with motivation for weight reduction in PLWH. That is, PLWH may perceive themselves as healthier (i.e., they are not wasting) if they are heavier than their average and lower weight counterparts. The protective effect of obesity may be especially true for PLWH that hold more positive beliefs about their body image, shape, and size. To further understand the complexities that HIV as well as weight stigma and body image might bring to weight status, these constructs are further defined below.

Components of Stigma

Stigma can be broken down into a series of responses, where (1) stigma may single out a person apart from others and (2) the person set apart from others becomes tagged as having undesirable characteristics (E. E. Jones, Farina, Markus, Miller, & Scott, 1984). This series of responses leads to persons feeling rejected and isolated as a consequence of these actions (i.e., being set apart from others and being marked as having an undesirable characteristic) (Link, Struening, Rahav, Phelan, & Nuttbrock, 1997). Link and Struening explain that stigma can be

conceptualized in a manner of degree, where some individuals are strongly or weakly associated with a set of undesirable characteristics, giving a level of marked strength to the rejecting response (i.e., isolation and undesirableness). For example, individuals who do not have HIV may reject PLWH due to their HIV diagnoses and deem them as having an undesirable characteristic—HIV/AIDS. Similarly, weight stigma has been defined as rejection and prejudice toward individuals as a result of negative attitudes, beliefs, and stereotypes some individuals may hold toward persons with overweight or obesity (Puhl et al., 2007). Stigma can further be conceptualized into three distinct categories—internalized, anticipated, and enacted (Earnshaw & Chaudoir, 2009). This framework was developed to address the structural and individual levels of HIV stigma. Internalized stigma is defined by the endorsement and application of negative beliefs associated with having HIV to oneself and is noted as the most common reaction to being diagnosed with HIV. For example, a PLWH may internalize negative beliefs associated with having HIV (i.e., beliefs of being undesirable, unclean, not valued, worthlessness, etc.) and perceive these beliefs to be true of them. Anticipated HIV stigma is the anticipation of being discriminated or stereotyped due to having HIV. For example, a PLWH may expect to be discriminated against by others to their HIV diagnosis. Enacted HIV stigma is the actual experience of being stereotyped and discriminated against and for having HIV. For example, a PLWH may experience in vivo rejection, isolation, and/or discrimination by others (e.g., friends, family members, health workers, and society in general) due to their HIV status.

Similarly, weight stigma for individuals with obesity has been defined as having external and internal constructs where internal weight stigma reflects the endorsement of negative beliefs about oneself due to weight status (Radcliffe et al., 2015). These negative beliefs include a negative self-evaluation, negative affect, and avoidance. External weight stigma is defined as the

social, political and interpersonal contexts that may contribute to weight biases of individuals with obesity. Weight stigma has also been shown to negatively impact psychological and physical health (Hunger & Major, 2014), eating pathology (Pearl et al., 2012) and has also been shown to increase caloric consumption (Schvey, Puhl, and Brownell, 2014).

Body Image

Body image is defined as a complex psychological experience of embodiment that not only includes one's physical appearance, but also self-perceptions and attitudes related to one's body, encompassing thoughts, beliefs, feelings and behaviors (Cash, 2004). Body image dissatisfaction has been well documented in the literature among individuals with obesity (Friedman, Reichmann, Costanzo, & Musante, 2002; Rudiger & Winstead, 2013) and poor body image has been shown to influence eating pathology (Fabricatore & Wadden, 2004) as well as negatively impact affective health and self-efficacy (Friedman, Reichmann, Costanzo, & Musante, 2002) in this population. Poor body image as also been found in PLWH (Corless, Nicholas, McGibbon, & Wilson, 2004) and has shown to be related to HIV stigma (Palmer et al., 2011). Palmer et al., found the probability of PLWH to have a positive body image in relation to HIV stigma to be lower for those that reported more HIV stigma; those that reported a higher degree of HIV stigma in the presence of depressive symptoms were more likely to have a poorer body image compared to those that reported lower HIV stigma in the presence of depressive symptoms. Positive body image in PLWH was also associated with greater medication adherence and higher CD4 counts in this study.

The Proposed Study

This study aimed to investigate whether weight status (i.e., overweight or obesity) serves as protective factor against HIV stigma, specifically from anticipated (i.e., the thought of being

discriminated against) and enacted HIV stigma (i.e., the actual experience of discrimination). PLWH may maintain a heavier weight as to protect them against enacted (i.e., actually experiencing) HIV stigma; however, the level of anticipated stigma endorsed might further explain this relationship as individuals who anticipate they *will* be discriminated against for having HIV may be more hyper vigilant to cues of discrimination, increasing their reports of these experiences. Finally, body image may change the direction or strength of the relationship between weight status and anticipated HIV stigma. Those with more positive attitudes about their body image may have fewer notions that they will be discriminated against for having HIV and believe that their diagnosis is being concealed by their weight. Furthermore, it may be that their belief that they are not seen as *visually* wasting by others and therefore may not anticipate *or* experience HIV stigma to the same degree as their under or ideal weight counterparts. In sum, the more positive a PLWH's body image, the less they may anticipate being discriminated against and the less they may report actually being discriminated against due to weight status. Similar differences were expected in anticipated and enacted *weight* stigma constructs such that persons with overweight and obesity would experience less anticipated and enacted weight stigma compared to their underweight and ideal weight counterparts.

Additionally, this study investigated dietary intake and body weight and potential associations between these variables and weight status. Analyzing dietary intake in PLWH may give more insight into the dietary habits of this population and identify dietary correlates that may be contributing to an unhealthy weight status. There remains much to learn from having dual diseases (i.e., obesity and HIV); having more information about the intersection of obesity and HIV can lead to tools that have the potential to impact overweight and obese health disparities that PLWH may face. Lastly, the results from this study have the potential to inform

weight management interventions (both prevention and treatment) with PLWH, placing additional emphasis on other health variables, such as body satisfaction, dietary intake, and stigma that have the potential to negatively impact overall health.

Hypotheses

Primary Aims

1. Body mass index is anticipated to impact the experience of enacted HIV stigma among PLWH with overweight and obesity, such that individuals with overweight and obesity will report less enacted HIV stigma than PLWH with an ideal weight. This model will; however, be mediated by anticipated stigma. The degree to which PLWH anticipate being discriminated or stereotyped is expected to mediate the effects of BMI on enacted stigma (Figure 1).
2. Body image is anticipated to moderate the effects of the first leg of the above specified mediated model. That is, a more positive body image will moderate the effects of anticipated HIV stigma and those with higher body images will report less anticipated HIV stigma (Figure 2).

Secondary Aims

1. There will be a moderated-mediated (i.e., conditional indirect effect) on the mediated effects of anticipated weight stigma on BMI and enacted weight stigma. Specifically, the effects of BMI on enacted weight stigma will be mediated by anticipated weight stigma; however, a conditional effect (i.e., body image) will moderate the first leg of anticipated weight stigma (Figure 3).
2. Overweight and obese PLWH are expected to have a higher (i.e., more positive) body image than normal and underweight participants.

3. Dietary intake is expected to be higher in fats (g) and less in fiber (g) and fruits and vegetable servings for participants with a BMI $\geq$25 kg/m^2 than participants with a BMI =18.5-24.9 kg/m^2.
4. Dietary intake is also expected to be higher in fats and less in fiber (g) and fruits and vegetables compared to recommended daily intakes for adult in the U.S. and estimated U.S. daily intakes.

Methods

Procedure

Data were collected in December of 2013. Participants were recruited from a yearly food donation give away in Atlanta Georgia via the SHARE Project and asked to voluntarily complete an anonymous survey prior to receiving their food donation. The SHARE Project is a community based research center and clinic for PLWH in Atlanta Georgia. All participants in this study are active clients of the SHARE Project and are involved in other studies with this group. Most participants resided in the city of Atlanta or directly outside the metropolis area. Participants had to be 18 years or older, HIV-positive and English speaking to be eligible for the study. Surveys were administered via audio computer-assisted self-interviews (ACASI) and height and weight was collected using a biomedical impedance analysis (BIA) scale. Research staff was on hand to assist participants with electronic equipment and reading glasses were provided to those that needed assistance in viewing the computer screen. Participants were asked to first complete the survey and then taken to a private area of the donation center to attain height and weight by trained research staff. Participants were asked to remove their coats, shoes and socks for accurate weight assessment. Height and weight were not collected for those who could not step on the scale due to physical disability and/or had a medical device that had the

possibility of interacting with electrical impulses of the scale. The University of Connecticut's Institutional Review Board approved this study.

Materials

HIV and Obesity Stigma Mechanism Measure: *The HIV Sigma Mechanism Measure* (Earnshaw et al., 2013) was developed to measure the specific mechanisms of stigma (i.e., internalized, enacted and anticipated) and possible health and well-being constructs associated within these frameworks. Earnshaw et al. (2013) adapted this measure from previous criteria specified in assessing HIV stigma (Earnshaw & Chaudoir, 2009). The measure uses a 5-point Likert-type scale where higher scores indicate greater levels of stigma. Anticipated, enacted and internalized stigmas were measured separately. Questions assessing anticipated HIV stigma included, "Because of my HIV status, family members will look down on me," "Because of my HIV status, community/social workers will not take my needs seriously." Questions assessing enacted HIV stigma included, "Because of my HIV status, family members have treated me differently," "Because of my HIV status, community/social workers have discriminated against me." Questions assessing internalized HIV stigma included, "Having HIV makes me feel like a bad person," "I feel ashamed of having HIV." Composite scores were calculated as Cronbach's alpha ($\propto$ = .87 - .89). For the purpose of this study, Earnshaw and colleagues HIV stigma framework was taken and adapted to assess anticipated, enacted and internalized levels of weight stigma. The same constructs of the measure were used; however, questions were adapted to reflect weight stigma instead of HIV. Questions assessing anticipated weight stigma included, "Because of my weight status, family members will look down on me," "Because of my weight status, healthcare workers will not listen to my concerns." Questions assessing enacted weight stigma included, "Because of my weight status, family members have treated me differently,"

"Because of my weight status, community/social workers have denied me services." Questions assessing internalized weight stigma included, "I think less of myself because of my weight," "I feel I'm not as good as others because of my weight." Reliability was consistent with Earnshaw et al. (2013) HIV stigma framework, yielding Cronbach's alpha of ($\alpha = .94$) for internalized weight stigma and ($\alpha = .96$) for anticipated and enacted weight stigma.

Body Shape Questionnaire: The Body Shape Questionnaire (BSQ) was developed to measure body image concerns in both clinical and non-clinical populations (Cooper, Taylor, Cooper, & Fairburn 1987). The shorten version is an 8-item self-report questionnaire where participants are asked questions about their subjective perceptions and attitudes of their body image. These perceptions and attitudes include, body's appearance, size, spatial position and competence. Examples of questions include, "How often has feeling full (for example, after eating a large meal) made you feel fat?" and "How often have you worried you will become fat or fatter?" Cut off scores are used to assess degree of body image, where scores less than 19 are defined as having no concern with shape, scores 19 to 25 are marked by mild concern with shape, scores 26 to 33 are marked by moderate concern with shape and scores over 33 are defined as having marked concern with shape. This shorten version has shown convergent and discriminant validity against other body image questionnaires (Evan & Dolan, 1992). For the purpose of this study and to shorten length of questions, 6-items were used; internal consistency of the items were assessed using Cronbach's alpha ($\alpha = .93$). Prorating was applied to 6-items as to be consistent with cutoff scores.

Body Image Assessment Scale: The *Body-Image Assessment Scale* was developed to measure perceived and desired body size (Thompson, 1990). The rating scale depicts 9 male and female silhouette drawings gradually increasing in size. Participants were presented with

silhouettes and asked to choose the picture that most accurately depicted their current size and then asked to pick the image that best depicts their ideal self. The difference in the two responses can then be used to estimate the degree of dissatisfaction with one's subjective body image (Thompson and Gray, 1995). Due to programing error, participants were only asked to choose the silhouette that most accurately depicted their size. Question asked was as follows, "Looking at the picture provided, select the number that best fits your body type."

Multi-Factor Screener: The *Multifactor Dietary Screener* (Sheehan & Macallan, 2000), developed by the National Cancer Institute, was used to assess approximate value of daily fruit and vegetable, percentage of energy from fat (g), and fiber (g) intake. The screener is a self-report questionnaire and participants are asked questions about usual nutritional intake over the past 30 days. Participants were asked to report how many times per day, week, or month they consumed the specified type of food(s) or beverage(s). Examples of questions include, "How many times per day, week, or month did you usually eat bacon, sausage, not including low fat, light, or turkey varieties," "How often did you eat fruit? Count fresh, frozen, or canned fruit. Do not count juices." This screener has shown to perform to the standard of the Food Frequency Questionnaire and shown to provide reasonable estimates of daily dietary intakes of above specified items. (Thompson et al., 2005).

Height, Weight, and Body Composition: A Bioelectrical Impedance Analysis (BIA) scale was used to measure body weight (kg) and height (in) and to obtain body fat percentage (% fat) by bioelectrical impedance. BIA measures opposition to electric current through body tissue (i.e., muscle and fat). This mechanism is often used by researches to assess body composition (i.e., body fat). Participants with pacemakers and other medical implants were not weighed due to potential harm or interaction with devices.

Health Characteristics: Medical histories of participants were all self-report and collected within the same setting. Participants were asked to report their CD4 T cell count, viral load, days spent in the hospital due to HIV/AIDS related care, as well as medication adherence. Participants were given an option of choosing not to disclose any information that was being asked of them or an option to state they were unaware of the answer to the question(s) being asked.

Data Analysis

Descriptive analyses were examined in order to obtain sample characteristics. Some exploratory analyses were conducted using nonparametric procedures in order to avoid violations of approximate normality. Fisher exact tests were used for group comparisons of categorical variables as some of the cells yielded a cell size of less than 10. Analysis of variance (ANOVA) was used for continuous variables and effect sizes were calculated using eta squared; Tukey's post hoc analysis was used to compare group differences. Single sample t-tests were used to compare differences between our samples reported dietary intake to recommended and estimated dietary consumption of adults in the U.S. Daily dietary recommendations of fiber (g) and percentage energy from fat (g) for men and women were attained from the United States Department of agriculture (USDA) (McGuire, 2011); fruits and vegetable recommendations were attained from National Center for Chronic Disease Prevention and Health Promotion. Means and standard deviations for normative comparison samples of estimated dietary intake of fat (g) and fiber (g) were attained from the USDA, *What we Eat in America*, NHANES survey (NHANES, 2012); estimated means and standard deviations of fruit and vegetable dietary intake were attained from the CDC state indicator report on fruit and vegetable consumption (McGuire, 2013)

PROCESS macro was used to assess observed mediation, moderation, and conditional process modeling (i.e., moderation-mediation) (Hayes, 2013). PROCESS uses a path analysis framework to assess models, placing emphasis on bootstrapping in constructing asymmetric confidence intervals for indirect effects in both simple and conditional process models. A conditional process model (i.e., moderated-mediation) is said to occur when the strength of an indirect effect depends on the level of a given variable (Precher, Rucker, & Hayes, 2009). Moderated-mediation model, as specified by Hayes (2013), was used to test whether anticipated stigma mediated the effects of BMI on enacted HIV stigma and if the relationship differed depending on level of body image. Additionally, the same model was used to test whether anticipated weight stigma mediated the effects of BMI on enacted weight stigma and if the difference of reported stigma depended on the status of body image. Bias corrected bootstrap confidence intervals (95%) were calculated to estimate direct, indirect and total effects using 5000 iterations. SPSS, Version 21 was used to carry out descriptive and exploratory analyses and a macro for PROCESS was installed into SPSS to test simple and conditional process models.

Additionally, It became evident that internalized HIV and weight stigma, not originally proposed in the specified models above, may be also related to BMI and body image. Post hoc analyses based on these observations were conducted and are reported and discussed within this paper.

Results

Participants

Participants were 678 PLWH; 7 participants were dropped from the analyses due to missing gender information. Out of 671 participants, body weight was assessed on 624 PLWH

(men = 428, women = 196). For the purpose of describing the data, participants were categorized by weight as follows: underweight (BMI $\leq$ 18.49 kg/m^2); ideal weight (BMI =18.50-24.99 kg/m^2); overweight (BMI = 25-29.99 kg/m^2) and obese (BMI $\geq$ 30 kg/m^2) (Table 1). Average BMI across all participants was 28.1 kg/m^2 (SD = 7.0; range = 17 to 58 kg/m^2) and mean age was 48.7 years (SD = 9.2; range = 21 to 71 years). Weight data showed more men (28.5%) were overweight than women (22.7%) and more women were obese (53%) than men (22.7%) (p = .001). There were no other demographic differences between weight categories. Participants identified themselves as 91.8% Black, 5.1% White, 1.5% Hispanic, 1.5% other and .1% Asian/Pacific Islander. At the time of data collection, 58.4% of participants reported receiving disability, with 21.7% reporting being unemployed; 34.8% of participants reported completing high school as their highest level of education, with 20.4% completing some high school and 3.1% reported completing 8th grade as their highest level of education.

Health characteristics (Table 2) by weight category (i.e., underweight, ideal weight, overweight and obese) revealed no differences between groups with the exception of CD4 T Cell count (p < .000). Participants with obesity had the highest reported CD4 count (M = 664; SD = 332) with those with an ideal weight reporting the least amount of CD4 cells (M = 509; SD = 260) and even more interesting is that participants that were underweight reported the 2nd highest CD4 cell count (M = 574; SD =260). There were no differences in year of HIV diagnosis by weight category; 18.4% reported an HIV diagnosis between 1985-1990, 17.7% reported a diagnosis between 2000-2005, 19.4% reported diagnosis between 1996-2000, and 37.1% reported diagnosis between 2001-2013. Of the sample, 16.7% persons reported a detectable viral load and 76.9% reported an undetectable viral load. Participants also reported an average of 1.18 lifetime overnight HIV/AIDS related hospital stays and 13.9% reported not currently taking any

HIV medications (i.e., Atripla, Truvada, Kaletra, AZT, etc.), with 8.2% reporting being out of their HIV medications.

Hypotheses

Primary Aim (1)

Prior to analyzing models, a correlation matrix was assessed including all variables in models (Table 3). Correlations displayed significant positive associations between enacted, anticipated, and internalized weight and HIV stigmas, ($p < .05$). Significant positive associations were also seen between BMI and enacted, anticipated and internalized weight stigma; however, no associations were seen between BMI and enacted, anticipated, and internalized HIV stigma.

For the purpose of analyzing this model, participants were grouped by weight category (underweight and ideal weight vs. overweight and obese). Participants that were measured as underweight were grouped with their ideal weight counterparts as it was hypothesized that both of these weight categories would prefer a heavier weight as to shield their HIV diagnosis. Furthermore, those in the underweight category ranged in BMI from 17-18.49 kg/m^2, which is considered *mildly thin* by WHO classifications (WHO, 2015). Finally, BMI was assessed in the model as a dichotomous variable instead of a continuous one as to compare any group differences between weight categories. For the first model, BMI was anticipated to impact the effect of enacted HIV stigma, such that individuals that were overweight and obese would report less enacted HIV stigma than those that were underweight and ideal weight. The model was proposed to be mediated by anticipated HIV stigma; that is, the degree to which PLWH anticipated being discriminated or stereotyped for having HIV was expected to mediate the effects of BMI on the degree to which PLWH reported experiencing being discriminated or stereotyped for having HIV (Table 4). PROCESS analyses displayed no meditational effects of

anticipated stigma through BMI on enacted HIV stigma (Table 5). Bias corrected bootstrapped confidence intervals (CI) showed no indirect effect (CI = -.295 to 1.040) of BMI category on enacted HIV stigma through anticipated HIV stigma. The direct and total effects were also not statistically different from zero, $t(622) = .0074$, $p = .9941$ with a 95% confidence interval (CI = -531 to .535) and ($t(622) = .828$, $p = .410$), with a 95% confidence interval (CI = -.509 to 1.25), respectively. Analyses were also run separately for both men and women and no results were found.

Primary Aim (2)

Body image was anticipated to moderate the effects of the mediated model of anticipated HIV stigma on BMI and enacted HIV Stigma. It was hypothesized that persons with a higher body image would endorse less anticipated stigma, which in turn would shield them from enacted stigma. As noted in primary aim 1, there were no mediation effects of anticipated BMI stigma on BMI and enacted HIV stigma. As there were no effects on the above-mentioned model, inferring a moderated-mediation would have no statistical significance and so the model was not assessed.

Secondary Aim (1)

It was hypothesized that there would be a moderation-mediation (i.e., conditional effect) of anticipated weight stigma on BMI and enacted weight stigma. That is, those persons that were measured as underweight or as having an ideal weight would report less enacted weight stigma; however, this would be mediated through the anticipation of being discriminated or stereotyped against due to weight status. This model was anticipated to be moderated by body image; those with a higher body image (i.e., more positive attitudes about body shape and size) would anticipate less discrimination due to their weight status, which in turn would negatively effect

experiencing weight stigma. Conversely, those persons that were measured as overweight or obese would report more enacted weight stigma; however, this would be similarly mediated by the anticipation of being discriminated against due to weight status. Descriptive data of variables are given in Table 6.

PROCESS analyses displayed no meditational effects of anticipated weight stigma through BMI on enacted weight stigma (Table 7). Bias corrected bootstrapped confidence intervals (CI) showed no indirect effect (CI = -0265 to 1.0512) of BMI category on enacted weight stigma through anticipated weight stigma. The direct effect was also not statistically different from zero, $t(622) = .3784$, $p = .7053$ with a 95% confidence interval (CI = -.3991 to .5897) as well as a total effect, $t(622) = 1.609$, $p = .1080$ with a 95% confidence interval (CI = -.1297 to 1.3089). Just as in the model above, a moderation- mediation model was not assessed, as there were no mediation effects in the first model. Analyses were also run separately for both men and women and no results were found.

Secondary Aim (2)

It was hypothesized that overweight and obese PLWH would be expected to hold a higher (i.e., more positive) body image than their underweight and ideal counterparts. Controlling for gender, a univariate ANOVA showed there was a statistically significant difference between groups ($F(4, 619) = 40.24$, $p = .000$); however, group differences varied from what was initially hypothesized. Tukey post-hoc test displayed persons with obesity to have a poorer body image (22.25 ± 10.60) than their underweight (15.31 ± 10.45, $p = .034$), ideal weight (11.98 ± 6.10, $p = .000$), and overweight (16.93 ± 8.84, $p = .000$) counterparts. Similarly, persons with overweight had a statistically different body image than those with an ideal weight ($p = .000$). Finally, persons with underweight showed no statistical difference from those with

an ideal weight (p = .555) and those with overweight (p = .922). There was also a significant difference in reported body image by gender ($F(1, 668) = 18.72$, p = .000), where females reported a poorer body image (18.94 ± 9.3) than males (15.54 ± 9.8).

As noted above, the BSQ uses cutoff scores to help assess concern with shape and those that scored less than 19 are identified as having no concern with shape, whereas those that score 19 to 25 are identified as having mild concern with shape, scores 26 to 33 are identified as having moderate concern with shape and scores over 33 are identified as having marked concern with shape. Fisher exact test also revealed differences in reported body image by weight categories ($X^2(1, N = 626) = 121.21$, p = .000); 69% of the sample reported having no concern with their shape with 11.7% reported mild concern with their shape, 11.2% reported moderate concern with their shape, and .09% reported marked concern with their shape.

Secondary Aim (3)

Dietary intake was expected to be higher in fats (g) and lower in fiber (g) and fruits and vegetable servings for participants with a BMI $\geq$25 kg/m^2 than participants with a BMI = 18.50 - 24.99 kg/m^2. One-way ANOVA showed group differences between fiber (g) intakes ($F(1, 539) = 4.817$, p = .029), participants with a BMI $\geq$25 kg/m^2 reported consuming less fiber (g) (16.5 ± 7.07) than those with a BMI = 18.50-24.99 kg/m^2 (18.00 ± 8.5). There were no group differences in reported percentage of fat(g) consumed (p = .276) and fruits and vegetables (p = .160). A 4 X 2 (weight category x gender) factorial analysis of variance tested the effects of weight category (i.e., underweight, ideal, overweight, and obese) and gender in their dietary intake of fruits and vegetables, percentage of calories from fat (g) and fiber (g) (Table 4). Results indicated a main effect for gender in consumption of fiber (g) (p = .020); men consumed more grams of fiber (18.14 ± 7.5) than women (15.2 ± 8.3). There were no other main effects or

gender x weight category interaction on reported fruit and vegetable servings or percentage of calories form fat (g) consumption.

Secondary Aim (4)

Dietary intake was also expected to be higher in fats and less in fiber (g) and fruits and vegetables compared to recommended daily intakes for adults in the U.S. and estimated U.S. daily intakes. Due to gender differences in dietary recommendations and estimates, groups were compared by gender. Results indicated differing intake of fiber (g) and intake of fruit and vegetable servings in men and women compared to the USDA's dietary guidelines (McGuire, 2011) (Table 8). Men reported consuming less fiber (18.14 ± 7.5) and fruits and vegetables (1.86 ± .76) per day than USDA recommendations of 38 grams of fiber and 5 servings of fruit and vegetables (p = .000). Similarly, women consumed less fiber (15.2 ± 8.3) and fruits and vegetables (1.7 ± .782) per day than USDA recommendation of 25 grams of fiber and 5 servings of fruits and vegetables (p = .000). Percentages of fat intakes for both men (34.3 ± 4.0) and women (33.6 ± 5.1) were within the recommended servings of 20-35g per day. Results also indicated differing estimates of fruit and vegetable intakes for both men and women compared to national estimated intakes. Men and women reported consuming less fruit and vegetables compared to CDC estimates of 2.7 servings per day (p = .000). There were no statistical differences in reported intake of fiber (g) and percentage energy from fat (g) for both men and women compared to NHANES national estimates for adults in the US.

Post Hoc Hypothesizing

As noted above, post hoc hypotheses were generated when it became evident that internalized HIV and weight stigma might also be related to BMI and body image. Specifically, it became apparent that participants' perceptions of their body image and internalized HIV

stigma might have more influence on weight status than actual experiences (i.e., enacted HIV stigma). Internalized HIV and weight stigma were not included in the first models as internalized stigma is proposed to represent endorsement and application of negative beliefs as applied to oneself (Earnshaw et al., 2013; Earnshaw & Chaudoir, 2009) and the initial proposed study intended to capture *actual* experiences of discrimination as a result of having HIV. One other factor that excluded internalized HIV stigma from the first model was previous evidence that showed internalized HIV stigma to be less likely associated with being diagnosed with a chronic illness comorbidity (i.e., asthma, diabetes, heart disease, hypertension, and hepatitis C).

How PLWH internalize negative beliefs about their HIV status may ultimately affect their health behaviors, specifically, weight status. Internalized HIV stigma encompasses beliefs of low self-worth (i.e., being less than) as well as perceptions that one may be deserving of negative outcomes due to having HIV (Earnshaw et al., 2013). Earnshaw et al., found internalized HIV stigma to be related to poorer affective health (i.e., helplessness, lower acceptance) and lower perceived benefits of having HIV as well as poorer health behaviors; greater likelihood of ARV non-adherence and more days in medical care gaps where also found. If evidence has shown internalized HIV stigma to be related to poorer health outcomes, one of these outcomes may also be weight status.

To look at these variables more closely, hypothesized models (i.e., predictors, outcomes, mediators and moderators) were modified post hoc. In earlier models, enacted HIV stigma was inputted as an outcome variable as it was initially hypothesized that persons that were overweight or obese may experience less stigma for their HIV status as a result of not fitting the stereotype of being underweight or wasting. The experience of stigma versus the internalization of stigma differ in their relation to health behaviors and it may be that the endorsement of these

negative believes has a greater influence in predicting weight status versus weight status predicting how much internalized HIV stigma one endorses. Hence, models were modified to include BMI as a continuous outcome variable and internalized HIV stigma as a predictor, with body image as a mediator.

Post Hoc Hypothesis 1

It was hypothesized that 1) internalized HIV stigma would be related to BMI with PLWH that experience more internalized HIV stigma having higher BMIs, and 2) that this relationship would be mediated by body image. More specifically, the endorsement of internalized HIV stigma (i.e., low self-worth, lower acceptance, poorer health behaviors) may result in a desire to shield one's HIV status, which can lead to a poorer body image and a greater desire to be overweight and obese.

PROCESS analyses displayed an indirect effect (i.e., meditation) of body image on internalized weight stigma through BMI (Table 9), as shown by a 95% bias corrected bootstrap confidence interval (CI = .115 to .247). The indirect effect was .178, suggesting that two PLWH who differ by one unit on their reported internalized HIV stigma are estimated to differ by .178 units on their BMI as a result of those with more internalized HIV stigma endorsing more negative feelings about their body image, which in turn translates into a higher BMI (Figure 4). The direct effect (c' = -.130) was also statistically different from zero, $t(622) = -2.62$, $p = .009$ with a 95% confidence interval (CI = -.228 to -.033). The coefficient is negative, meaning that the persons that endorse more internalized HIV stigma, but who are equal on their level of body image are estimated to be .130 units lower on their BMI. The more a person endorses HIV stigma the lower their BMI; *however*, only when body image is equal. When body image differs in units, those who endorse more internalized HIV stigma endorse a poorer body image and have

a higher BMI. The total effect was not statistically different from zero, $t(622) = .846$, $p = .398$ with a 95% confidence interval (CI = -.706 to .919). Mediation analysis no longer imposes evidence of an association of X and Y prior to estimating direct and indirect effects and so the absence of a total effect does not discount the meditational model (Zhao, Lynch, & Chen, 2010; Hayes, 2009; 2013).

Analyses were also run separately for men and women and similar results were found. PROCESS analyses displayed an indirect effect (i.e., meditation) of body image on internalized weight stigma through BMI in men, as shown by a 95% bias corrected bootstrap confidence interval (CI = .070 to .188). The indirect effect was .121, suggesting that two PLWH who differ by one unit on their reported internalized HIV stigma are estimated to differ by .121 units on their BMI as a result of those with more internalized HIV stigma endorsing more negative feelings about their body image, which in turn translates into a higher BMI. The direct effect and indirect effect were not statistically different from zero, (CI = -172 to .002 and -.060 to .132, respectfully).

Similarly, PROCESS analyses displayed an indirect effect (i.e., meditation) of body image on internalized weight stigma through BMI in women, as shown by a 95% bias corrected bootstrap confidence interval (CI = .120 to .436). The indirect effect was .258, suggesting that two PLWH who differ by one unit on their reported internalized HIV stigma are estimated to differ by .258 units on their BMI as a result of those with more internalized HIV stigma endorsing more negative feelings about their body image, which in turn translates into a higher BMI. The direct effect and indirect effect were not statistically different from zero, (CI = -172 to .002 and -.060 to .132, respectfully).

Post Hoc Hypothesis (2)

As noted above, body image was evidenced to be more of a driving force behind weight status and it was thus hypothesized that body image could also serve as a predictor variable, predicting internalized HIV stigma; however, it was hypothesized this relationship would be moderated by BMI. To simplify the moderation, BMI was dichotomously categorized as X=0 (those that were underweight or had an ideal weight) and X =1 (those that were overweight or obese). PROCESS displayed a moderation effect (BMI x body image) that was statistically different from zero ($t(620) = -3.024$, $p < .001$) (Table 10). The effect of body image on internalized weight stigma was shown to be *conditional* and dependent on BMI category ($t(620) = 5.902$, $p < .001$). The model displayed that between two people that had a BMI ≤ 24.99 and who differ by one unit on their body image; the person with poorer body image is estimated to endorse .289 units more internalized HIV stigma (Figure 5). Whereas, between two people that had a BMI ≥ 25 and who differ by one unit on their body image; the person with a poorer body image were estimated to report .123 more units of internalized HIV stigma. In other words, internalized HIV stigma increased for both groups as the degree of poorer body image increased; however, it increased more for individuals with a BMI ≤ 24.99 (Figure 6).

Analyses were also run separately for men and women and similar results were found. PROCESS displayed a moderation effect (BMI x body image) that was statistically different from zero ($t(424) = -2.478$, $p < .01$) in men. The effect of body image on internalized weight stigma was shown to be *conditional* and dependent on BMI category ($t(424) = 4.908$, $p < .001$). The model displayed that between two people that had a BMI ≤ 24.99 and who differ by one unit on their body image; the person with poorer body image is estimated to endorse .264 units more internalized HIV stigma. Whereas, between two people that had a BMI ≥ 25 and who differ by one unit on their body image; the person with a poorer body image were estimated to report .108

more units of internalized HIV stigma. In other words, internalized HIV stigma increased for both groups as the degree of poorer body image increased; however, it increased more for individuals with a BMI ≤ 24.99.

Similarly, PROCESS displayed a moderation effect (BMI x body image) that was statistically different from zero ($t(192) = -2.225$, $p < .05$) in women. The effect of body image on internalized weight stigma was shown to be *conditional* and dependent on BMI category ($t(192) = 3.524$, $p < .001$). The model displayed that between two people that had a BMI ≤ 24.99 and who differ by one unit on their body image; the person with poorer body image is estimated to endorse .445 units more internalized HIV stigma. Whereas, between two people that had a BMI ≥ 25 and who differ by one unit on their body image; the person with a poorer body image were estimated to report .151 more units of internalized HIV stigma. In other words, internalized HIV stigma increased for both groups as the degree of poorer body image increased; however, it increased more for individuals with a BMI ≤ 24.99.

Post Hoc Hypothesis (3)

To gain a better understanding of what internalized weight stigma may look like in this population a meditational model was run focusing only on weight stigma. It was hypothesized that internalized weight stigma could predict BMI; however, just as with internalized HIV stigma it too would be mediated by body image. PROCESS analyses displayed an indirect effect of internalized weight stigma on BMI through body image, as shown by a 95% bias corrected bootstrap confidence interval (CI = .317 to .491). The indirect effect was .401, displaying that two PLWH who differ by one unit on their reported internalized weight stigma are estimated to differ by .401 units on their BMI as a result of those with more internalized weight stigma endorsing more negative feelings about their body image, which in turn translates into a higher

BMI (Table 11). The direct effect (c' = -.099) was not statistically different from zero, $t(622) = -1.87$, $p = .062$ with a 95% confidence interval (CI = -.204 to .005) (Figure 7). As the direct effect is not statistically different from zero, it displays that there is no evidence of an association between internalized weight stigma and BMI when body image is accounted for. The total effect was statistically different from zero, $t(622) = 6.54$, $p < .001$ with a 95% confidence interval (CI = .211 to .391). This displays that two people who differ by one unit on their endorsement of internalized weight stigma are estimated to differ by .301 units on their BMI. Since the coefficient is positive, the person who endorses more internalized weight stigma is estimated to have a higher BMI.

Models were also run separately for men and women, displaying similar results. PROCESS analyses displayed an indirect effect of internalized weight stigma on BMI through body image in men, as shown by a 95% bias corrected bootstrap confidence interval (CI = .070 to .188). The indirect effect was .121, displaying that two PLWH who differ by one unit on their reported internalized weight stigma are estimated to differ by .121 units on their BMI as a result of those with more internalized weight stigma endorsing more negative feelings about their body image, which in turn translates into a higher BMI. The direct effect and total effect were not statistically different from zero, (CI = -.172 to .002 and -.060 to l32, respectfully).

Similarly, PROCESS analyses displayed an indirect effect of internalized weight stigma on BMI through body image in women, as shown by a 95% bias corrected bootstrap confidence interval (CI = .362 to .698). The indirect effect was .512, displaying that two PLWH who differ by one unit on their reported internalized weight stigma are estimated to differ by .512 units on their BMI as a result of those with more internalized weight stigma endorsing more negative feelings about their body image, which in turn translates into a higher BMI. The direct effect (c'

= -.242) was also statistically different from zero, $t(193) = -2.62$, $p = .037$ with a 95% confidence interval (CI = -.469 to -.014). The coefficient is negative, meaning that the persons that endorse more internalized weight stigma, but who are equal on their level of body image are estimated to be .242 units lower on their BMI. The more a person endorses internalized weight stigma the lower their BMI; *however*, only when body image is equal. When body image differs in units, those who endorse more internalized weight stigma endorse a poorer body image and have a higher BMI. The total effect was also statistically different from zero, with a 95% confidence interval (CI = .071 to 469). The coefficient is positive, meaning those higher on their internalized weight stigma are estimated to have a BMI that is .270 units higher.

Post Hoc Hypothesis (4)

As noted above perceptions of how a person perceived their weight status were assessed (Table 11). Many individuals were noted to perceive themselves as being *slightly* or *very* underweight when their actual BMI measured them to have an ideal weight, be overweight or be obese. Prior to testing this model, participants' perceptions of their weight status were compared. Cross-tab descriptives suggest that 29.2% of participants with obesity perceived themselves to be very overweight, with 52% slightly overweight, 13.4% identifying as about the right weight, 3.5% identifying as being underweight and 2% as being very underweight (Figure 8). Similarly, 3% of participants with overweight, identified themselves as being *very* overweight, 31.7% as *slightly* overweight, 56.9% as *about* the right weight, 7.8% as *slightly* underweight and .6% as *very* underweight. Out of the participants with an ideal weight, 0% identified themselves as *very* overweight, 2.4% identified themselves as *slightly* overweight, 57.6% as *about* the right weight, 31.4% as *slightly* underweight and 8.6% as very underweight. Out of the participants that were measured as underweight, 16.7% identified themselves as *very*

overweight, 0% as *slightly* overweight, 16.7% as *about* the right weight, 25% as *slightly* underweight and 41.7% as *very* underweight. Overall 42.3% of the sample identified themselves as being *about* the right weight, with 16% *slightly* underweight and 5% very underweight. Across all participants, only 38.5% *accurately* perceived themselves to be the weight they were assessed to be. Additionally, 11.9% of the sample reported slightly agreeing that overweight was a healthier weight than underweight; 12.1% reported moderately agreeing and 11.8% reported strongly agreeing with this statement. 15.5% reported slightly agreeing that they tried to gain weight in order to be healthy, 12.7% stated they moderately agreed and 22.7% stated they strongly agreed with this statement.

It was thus hypothesized that perceptions of weight status would be related to BMI. Specifically, persons that perceived their weight to be *very* or *slightly* underweight would desire a heavier body weight as to fit their perception of an ideal weight. The following model served two purposes; first, to assess whether a person's perceptions of their weight might be able to predict their BMI and secondly, to assess all variables (i.e., internalized, enacted, and anticipated HIV and weight stigma together along with body image) as to see how much of the variance of BMI could be accounted for by these variables as well if any of these variables would mediate perceptions of weight status on BMI.

To assess individual perceptions of weight on BMI, a multi-categorical, parallel multiple mediator model was used. The use of a parallel multiple-mediator model allows for the simultaneous assessment of each potential mediator while also accounting for any possible shared association between variables and the use of a multi-categorical model allows one to assess all categories simultaneously, while using one category as a reference group (Hayes, 2013; Hayes and Preacher, 2014). MEDIATE macro was used to assess model (Hayes, 2012)

and groups were categorized according to Hayes and Preacher (2014) multi-categorical predictor recommendations where indictor codding uses dummy coding, with D_i set to 1 if a case is in group *i*, and 0 otherwise. In this model D_i = perception of weight status and persons that perceive themselves to as *very* underweight was set as the reference group; parameters in the models displayed differences relative to this group. Groups were categorized as follows: D_1 = persons that identified themselves *slightly* underweight, D_2 = *about* the right weight, D_3 = *slightly* overweight, and D_4 = *very* overweight. Descriptive characteristics are displayed in Table 12.

Controlling for gender, MEDIATE macro displayed potential mediators in the model (figure 9) to account for very minimal variance alone from R^2 = .007 to .165 for enacted, anticipated and internalized HIV and weight stigma ($F(5, 618) = 140.44$, $p < .001$) (Tables 13-16). The variable that accounted for the most variance in the model was body image, R^2 = .316; and over half of the variance in BMI was accounted for by all variables combined R^2 = .551, ($F(12, 611) = 62.384$, $p < .001$); however, the model only displayed relative indirect effects of weight stigma and body image.

Relative indirect effects of internalized weight stigma for those that perceived themselves to be *slightly* underweight and *about* the right weight were significant, as shown by a 95% bias corrected bootstrap confidence interval (CI = .055 to .787 and .085 to 1.039, respectively). Persons that perceived their weight to be *slightly* underweight endorsed 3.93 less units of internalized weight stigma ($t(618) = -3.48$, $p < .001$) relative to those that perceived themselves to be *very* underweight and had a BMI that was .377 units higher as a result of their perception of being *slightly* underweight on internalized weight stigma. Similarly, those that perceived themselves to be *about* the right weight endorsed 5.49 less units of internalized obesity stigma

($t(618) = -5.27$, $p < .001$), relative to those that perceived themselves to be *very* underweight (Table 14) and had a BMI that was .527 units higher as a result of their perception of being *about* the right weight on internalized weight stigma. Holding perceptions of being *very* underweight constant displayed that those that endorse less internalized weight stigma also had a BMI that was .096 units less, ($t(618) = -1.92$, $p < .05$).

MEDIATE macro also displayed relative indirect effects of body image for those that perceived themselves to be *slightly* overweight and *very* overweight as shown by a 95% bias corrected bootstrap confidence interval (CI = .517 to 1.510 and 1.17 to 2.760, respectively) (Table 16). Persons that perceived themselves to be *slightly* overweight endorsed 7.31 more units of poorer body image relative to those that perceived themselves to be *very* underweight and had a BMI that was .97 units higher as a result of the effects of perception of their weight status on body image. Similarly, those that perceived themselves to be *very* overweight endorsed 14.39 more units of poorer body image relative to those that perceived themselves to be *very* underweight and had a BMI that was 1.91 units higher as a result of their perceptions of their weight status on body image. Holding perceptions of being *very* underweight constant also displayed that those that endorsed more negative perceptions of their body image also had a BMI that was .130 units more, ($t(618) = 4.61$, $p < .001$).

The model also displayed direct effects of perceptions of weight status on BMI. Relative to those that perceived themselves as being *very* underweight, all other groups had a BMI that was higher in units starting with .44 more for those that perceived themselves to be *slightly* underweight, 2.35 units for those that perceived themselves to be *about* the right weight, 7.91 units for those that perceived themselves to be *slightly* overweight and 13.2 units for those that perceived themselves to be *very* overweight.

Discussion of Hypotheses

Primary Aims (1 and 2)

It was proposed that there would be a mediation of anticipated HIV stigma on BMI and enacted HIV stigma. Specifically, it was hypothesized that overweight and obese PLWH would experience less HIV stigma due to their weight status and that this effect would be mediated by anticipated HIV stigma. This hypothesis was not confirmed and analysis of the model displayed no indirect effects of anticipated stigma on BMI and enacted stigma as well as no direct and total effects. A meditational model is said to answer the question of *how* some causal agent (i.e., the predictor) transmits its effect on the outcome and pathways from the predictor are traced in every direction that leads to the outcome (Hayes, 2013). In our model no effects were found in any possible pathway direction, which may indicate that there is no causal relationship between weight status and experiencing stigma due to being a PLWH. In this proposed hypothesis it may be that selecting anticipated HIV stigma as a mediator was erroneous and the question of *how* weight status and enacted HIV stigma are related may be answered through some other variable(s). Moreover, stigma levels were relatively equal across groups and though there was not a significant difference, enacted and anticipated stigma was higher in persons with overweight and obesity. Finally, persons with more positive attitudes about themselves may feel better about their self as a whole and may be less responsive to stigmas. Studies have shown positive self-body talk to be inversely related to body-related cognitive distortions and positively related to self-esteem, and positive body satisfaction (Rudiger & Winstead, 2013).

Secondary Aim (1)

It was hypothesized that there would be a moderation-mediation of anticipated weight stigma on weight status (BMI) and enacted weight stigma; the mediated model was also

anticipated to be moderated by body image. A simple mediation model displayed no direct, indirect, or total affect of the variables in the model. As there was no mediation, a moderation-mediation was not assessed. Similar to the model above, the lack of effects may be due to variables chosen in the models. A correlation matrix (Table 3) did show associations between weight stigma variables and BMI; however, it should also be noted that overall means of enacted and anticipated weight stigma were similar across BMI categories (M= 8.7 and 9.3 and M = 13.1 and 14.2, respectively). The absence of any significant difference in enacted and anticipated weight stigma may have resulted in null effects of the model.

One other explanation may be the validity of the measure used to assess weight stigma. As stigma is a complex construct, Earnshaw's et al. (2013) HIV stigma framework and measure were adapted to identify and break down potential processes of weight stigma into components of anticipated, enacted and internalized. To this writer's knowledge no other study has adapted Earnshaw's et al., stigma model in order to assess weight stigma in the context of this framework. It was believed that adapting Earnshaw's et al. stigma framework to assess weight stigma across these constructs would further define stigma beyond the scope of what is already known and provide a platform upon which to further understand its complexity. Nonetheless, the use of a more standardized weight stigma measure may have yielded varying results.

Lastly, it may be that there is an association between weight status and enacted weight stigma; however, not in our population sample. Over 91% of our population identified themselves as black and literature has shown black person's of color to historically have higher positive body images than their white counterparts (Lynch & Kane, 2014). Specifically, black women have been shown to consider themselves more attractive and socially acceptable with a higher BMI and standards of beauty have shown to differ as some black persons of color may

lack a desire for thinness as defined by western standards (Padgett & Biro, 2003). It may then be that the weight standard held among this population may not be serving as a protective factor against HIV stigma as initially hypothesized, but as an ideal that has been held over generations.

Secondary Aim (2)

It was hypothesized that overweight and obese PLWH would be expected to hold a higher (i.e., more positive) body image than their underweight and ideal counterparts. Results displayed significant differences in body image measures. Contrary to initial hypotheses, those individuals who were obese had the poorest body image compared to the rest of the groups; however, it is important to note that body image was quite high across all of the groups. Individuals that were underweight, had an ideal weight, or were overweight reported no concern with their shape. Overall, approximately 69% of the sample reported having no concern with their shape. As noted above, these results are similar to what has been seen in the literature, where black persons of color have historically shown to have less concerns with their shape and size and have an overall higher body image than their white counterparts (Wildes, Emery & Simons, 2001).

Secondary Aims (3 and 4)

Dietary intake was hypothesized to be higher in fats (g) and less in fiber (g) and fruits and vegetable servings for participants with a BMI $\geq$25 kg/m^2 than participants with a BMI = 18.50-24.99 kg/m^2. This hypothesis was partially confirmed with persons with overweight or obesity consuming less fiber (g) than underweight and ideal weight persons. No differences were found in intake of fiber (g) and fruits and vegetables across weight categories. A comparison of intake between this sample and USDA dietary guidelines as well as estimated US intake also displayed differences in daily consumption. Across all participants, men and women reported consuming

less fiber (g) and fruits and vegetables than USDA dietary recommendations; however, percentage of fat consumption was within recommended servings for both men and women. A comparison to national trends in intake of fruits and vegetables suggested that men and women consume less servings than the national average. There were no differences in the consumption of fiber and percentage of fat intake. These group differences suggest that both men and women may not be meeting the recommended intake of fiber (g) and servings of fruits and vegetables with detrimental energy balance implications. Higher intakes of fruits are associated with lower risk of becoming overweight or obese in women (Rautiainen et al., 2015) and fruit and vegetable intake has also been shown to be related to decreases in weight in both men and women (Bes-Rastrollo, Martínez-González, Sánchez-Villegas, la Fuente Arrillaga, & Martínez, 2006; Buijsse et al., 2009; Sartorelli, Franco, & Cardoso, 2008). Similarly, fiber intake has also been inversely associated with body weight and has shown to have preventive measures against obesity (Howarth, Huang, Roberts, & McCrory, 2005; Salvin, 2005). This study suggests that both fruit and vegetable intake and fiber intake would be appropriate targets for intervention in PLWH.

Post Hoc Hypothesis (1)

It was hypothesized that internalized HIV stigma would be related to BMI and that the relationship would be mediated by body image. A simple mediation model of Internalized HIV stigma on BMI displayed indirect and direct effects of this model. The model confirmed the hypothesis and showed persons with more internalized HIV stigma endorsed more negative feelings about their body, which in turn translated into a higher BMI. These results are similar to earlier findings, where experiencing depressive symptoms and HIV stigma increased the likelihood of endorsing a negative body image (Palmer et al., 2011). Additionally, Palmer et al.,

found an association between HIV stigma and endorsing a negative body image even in the absence of experiencing depressive symptoms.

The question that must now be asked is: Why is more internalized HIV stigma associated with a poorer body image, which in turn may be influencing BMI? One simple explanation is that internalized HIV stigma is the endorsement and application of negative beliefs about oneself due to having HIV and if one is endorsing negative beliefs about their self than they may also have an overall poorer outlook on their overall image, including their body image. In this instance, weight status may be a reflection of these overall negative beliefs as applied to ones self and in turn these individuals may be less likely to engage in healthful behaviors (i.e., exercise, eating nutritious foods) which could in turn lead to a heavier weight status. It is then possible that a heavier weight status may not be serving as protective factor against experiencing HIV stigma, but more so be a result of how a person perceives themself overall.

Post Hoc Hypothesis (2)

As body image was also noted to be a potential driving force in weight status, it was included in a separate model as a predictor of internalized HIV stigma, hypothesizing that the relationship would be moderated by BMI category. Results displayed a moderation effect, where individuals who were overweight or obese displayed more internalized HIV stigma than ideal and underweight persons. Overall, internalized HIV stigma increased for both groups (i.e., underweight and ideal vs. overweight and obese) as the degree of poorer body image increased; however, it increased more for persons that were underweight or had an ideal weight. These results indicate for *who* does body image effect internalized HIV stigma. It may give partial evidence to initial hypotheses of weight status being a protective factor against HIV stigma; however, it may also be that body image is related to the endorsement of negative beliefs of

oneself. As noted in the model above, body image and internalized HIV stigma may be related to each other due to *overall* negative perceptions of oneself. The poorer an individual perceives their body image to be the more internalized HIV stigma they might endorse as a result of having an overall negative view of their self.

These results should be taken with extreme caution as these two constructs (i.e., body image and internalized HIV stigma) may share similarities in assessing overall liking of one's self. In addition, well over half of the sample endorsed very few negative perceptions of their body image to begin with and results are based on an overall higher body image. Hence, poorer body image is reflective of this baseline and though increased were seen, these increases may still be below cut off scores for those that endorse no concern for their shape.

Post Hoc Hypothesis (3)

It was hypothesized there would be a meditational effect of body image on internalized weight stigma and BMI results confirmed this hypothesis. Those that endorse more internalized weight stigma were shown to endorse more negative feelings about their body, which in turn translated into a higher BMI. Just as in the first proposed model the question of *how* internalized weight stigma is related to BMI is answered by body image. Similarly, results displayed a positive effect of internalized weight stigma on body image (i.e., the more internalized weight stigma one endorsed, the poorer their body image). What was more interesting is lack of a direct effect, with no association between internalized weight stigma and BMI when body image was accounted for. These results also confirm previous studies, where increases in weight stigma have been shown to be related to increases in obesity (Ratcliff, Jenkins, Reiter-Purtill, Noll, & Zeller, 2011) as well as increases in caloric consumption (Pearl et al., 2012), which may explain the relationship between body image and a higher BMI.

Post Hoc Hypothesis 4

The final model was assessed in order to gather a better understanding of how perceptions of weight status may be related to BMI. As shown in earlier models, body image, internalized HIV stigma and internalized weight stigma were identified as influential factors; however, earlier models were assessed without accounting for these perceptions. More than half of the participants that were overweight perceived themselves to be *slightly* overweight. This is an important note and may give more evidence to a differing *ideal* weight than what is considered healthful. Similarly, more than half of participants with overweight identified themselves as being *about* the right weight. Discrepancies between *perceptions* of weight status and *actual* weight may give more evidence to PLWH desire for a weight that is considered ideal and more indication of an overall desire for a heavier weight.

In addition, earlier models only included one variable in the model and this model assessed all mediators together accounting for any possible shared association between them. A multi-categorical, parallel multiple-mediator model found that all variables together accounted for more than half of the variance of BMI. Internalized, enacted and anticipated weight and HIV stigma along with body image had strong influence on weight status. However, only internalized weight stigma and body image displayed meditational effects for persons that perceived themselves to be *slightly* underweight and *about* the right weight. Persons that perceived themselves as *slightly* or *about* the right weight endorsed less internalized weight stigma than those that perceived themselves to be *very* underweight with no group differences between those that perceived themselves to be *very* underweight and *slightly* or *very* overweight. What was more interesting is that those that perceived themselves to be *slightly* underweight had a BMI that was higher as a result their perceptions of being *slightly* underweight on their endorsement

weight stigma, which in turn translated into a higher BMI. Similar results were found for those that perceived themselves to be *about* the right weight. These results not only suggest that the two groups endorsed less internalized weight stigma but also had a higher BMI as a result of their perceptions and endorsing less internalized weight stigma. Endorsing less internalized weight stigma compared to those that perceived themselves to be *very* underweight is expected as those that perceived themselves to be *very* underweight might hold more negative perceptions about themselves if they desire a heavier weight status. Moreover, it would also be expected for those that perceived themselves to be *very* underweight to have a lower BMI relative to those that perceived themselves to be *slightly* underweight or *about* the right way based on these perceptions. The model also displayed that holding perceptions of being *very* underweight constant, the less internalized weight stigma one endorsed the lower the BMI.

As noted earlier, the most influential variable in the model was body image, accounting for 31.6% of the variance in BMI. The model displayed indirect effects for those that perceived themselves to *slightly* or *very* overweight. Persons that perceived themselves to be *slightly* or *very* overweight endorsed more negative perceptions about their body image relative to those that perceived themselves to be *very* underweight and had a higher BMI as a result of these perceptions on body image. Additionally, holding perceptions of being *very* underweight constant revealed that those that held more negative perceptions of their body image had a higher BMI overall.

The question of *how* perceptions of weight status are related to BMI was answered by internalized weight stigma and body image. Though all predictors together accounted for much of the variance of BMI, it was only these two mediators that displayed indirect effects on perceptions of weight and BMI. Similar to findings above, it seems that internalized weight

stigma and body image may be more influential to weight status overall. As noted earlier, weight status in essence may not be a serving as protective factor in concealing one's HIV status, but more so be a reflection of holding a differing ideal about what is considered healthy.

Conclusion

This study aimed to investigate the effects of HIV stigma on weight status. Specifically, initial hypotheses sought to answer whether an overweight or obese weight status might protect an individual from the stigma of having HIV as a heavier weight may be more desirable to protect oneself against discrimination faced by having HIV. Being overweight or obese did not result in anticipating or experiencing less stigma due to HIV status and endorsement of these stigma components across levels of BMI (i.e., underweight, ideal weight, overweight, and obese) were shown to be relatively equal. As stated earlier, it may be that weight status and experiencing HIV stigma are related; however, variables included in earlier models were unable to capture this association. One other explanation may be that the desire to maintain a heavier weight does not stem from wanting to conceal one's HIV status, but rather a desire to fit the norm for this population. Over 91% of the sample identified their race as black and black persons of color have historically been noted to desire a higher BMI in order to consider themselves more attractive and have also been shown to have a lower desire for thinness (Padgett & Biro, 2003) compared to their white counterparts. This is consistent with body image results with over 69% of this sample reported having no concerns with their weight and only 22.3% of the sample reporting mild or moderate concerns.

This study was able to assess internalized HIV stigma in relation to body image and BMI and results showed that body image mediated the effects of internalized HIV stigma on BMI. Overall, the more internalized HIV stigma one endorsed, the poorer their body image and the

higher their BMI. Body image was also able to predict the amount of internalized HIV stigma endorsed, where the worse one's body image, the more internalized HIV stigma; however, this relationship was moderated by BMI. Amount of internalized HIV stigma increased as body image worsened; more importantly, internalized HIV stigma increased more for those with a BMI $\leq$ 24.99. Overall, as body image worsened so did internalized HIV stigma; however, it worsened more for those with an ideal weight status. This may again reflect the cultural norms of the sample in valuing a heavier body weight. PLWH in this predominately Black sample may not be maintaining a heavier weight status to conceal their HIV diagnosis, but rather, as a desire to fit their group norm and the positive relationship between internalized HIV stigma and body image may be reflective of this notion.

Perceptions of weight status were also associated with BMI and meditational models displayed significant effects of weight stigma and body image on BMI. After controlling for gender, all mediators in the model (i.e., anticipated, enacted, and internalized HIV and weight stigma, and body image) contributed to over half of the variance in BMI. However, it was only weight stigma and body image that had significant meditational effect in the model and displayed endorsement of internalized weight stigma for those that perceived themselves to be *slightly* or *about* the right weight to be less than those that perceived themselves to be *very* underweight. This may seem paradoxical as the endorsement of internalized weight stigma is thought to reflect negative beliefs about being overweight or obese; however, the internalized weight stigma questions asked of participants did not specify if they were dissatisfied with being overweight or obese, rather only if they were dissatisfied with their weight in general. Examples of these questions include, "My weight makes me feel like I'm a bad person," "I feel I'm not as good as others because of my weight," "I feel ashamed because of my weight." As literature has shown

black persons of color to desire a heavier weight, it would be expected that a person who perceives himself or herself as very underweight may endorse more negative believes and one other reason a similar discrepancy was not seen between persons that perceived themselves to be *slightly* overweight or *very* overweight.

In addition to internalized weight stigma and similar to what was shown in early models, body image also displayed mediation effects on BMI among those that perceived themselves to be *slightly* or *very* overweight. Persons that perceived themselves to be *slightly* or *very* overweight had a poorer body image relative to those that perceived themselves to be very underweight, which may have resulted in these groups having a higher BMI. Here, the relationship between body image and perception of weight becomes more prominent; however, as noted earlier a poorer body image is not truly reflective of an overall poor body image in that more than two-thirds of the sample reported no concerns with their weight. Those that perceived themselves to be *slightly* overweight reported overall *mild* concerns with their shape and those that perceived themselves to be *very* overweight reported overall *moderate* concerns with their shape. Nonetheless, the question of *how* perceptions of weight status are related to BMI may be answered by body image and results did indicate a major jump in poorer body image among these groups. It should also be noted that these results are reflective of *perceptions* of weight and not *actual* weight status. Discrepancies in perception of weight versus actual weight gives more evidence to early statements in that it may be black persons of color may desire a heavier weight outside of what is deemed a healthy. Additionally, approximately one-third of the sample reported that a heavier weight more health and approximately half of the sample agreed that they wanted to gain weight in order to be healthier.

Overweight and obesity and poor dietary intake were common in this sample. Over half of our sample did not meet an ideal weight criteria and this excessive weight may interfere with CD4 cell count and ART therapy. Similar to other results, our sample displayed persons with obesity to have higher CD4 cell counts than persons that were overweight, had an ideal weight or were underweight. Despite the higher CD4 count seen here, longitudinal studies have displayed inverse affects in the HARRT era (Crum-Cianflone et al., 2010). PLWH that also suffer from obesity have shown to have 28 fewer CD4 cells than those with an ideal weight and over time similar aggregation of cell changes by BMI could result in obese individuals with 100 fewer CD4 cells than those with ideal weight (Crum, et al., 2010).

Nutritional intake is also important in the care of PLWH. Poor nutrition quality has been shown to have aversive affects with ART therapy as well as CD4 cell count. Our data showed nutritional deficits in fiber and fruit and vegetable intake and overall deficits compared to national estimates of fruit and vegetable intakes, regardless of gender or weight status. Nutritional intake also has an effect on weight status and overall persons who have shown to have low intake of fiber and fruits and vegetables have been shown to be more likely overweight or obese as was shown in our results (Bes-Rastrollo et al., 2006; Buijsse et al., 2009; Howarth et al., 2005; Rautiainen et al., 2015; Sartorelli et al., 2008).

There are many limitations to this study that should be noted. This was a cross-sectional study and sample data were collected from a specific region of the US. (i.e., Atlanta Georgia); therefore, results may not generalize to other population of PLWH. A longitudinal study may be needed in order to assess if similar results are rendered over time. Additionally, all data with the exception of anthropometrics was self-report and though participants privately and anonymously gave answers via a computer-assisted program, there may be discrepancies in the data reported.

This may be especially true for health data (i.e., CD4 count, viral load) and nutritional intake. In order to assess true levels of CD4 cell counts, viral loads and nutritional intakes, biomarkers such as blood samples for CD4 counts and carotenoids for fruit and vegetable intakes should be taken. Lastly, measures used in analyses (i.e., Earnshaw's HIV stigma framework adapted to measure weight stigma), to this writer's knowledge, have not previously been used in this context and the use of a more known and standardized measure in assessing weight stigma may have given differing results.

In summary, mediation and moderation analyses attempt to answer the questions of *how* one variable is effected by an other and for *who* and *when* does this relationship effect the other (Hayes, 2013). Initially, this study attempted to answer whether weight status was serving as a protective factor against experiencing HIV stigma and if so *how*? First hypothesized models did not show any differences in experiencing HIV stigma across BMI categories; however, models did show a relationship between internalized HIV stigma, body image and BMI. This relationship indicated that internalized HIV stigma can predict BMI through body image (i.e., the *how* of the question). The more internalized HIV stigma one endorsed, the worse their body image and the higher their BMI. Models also suggest for *who* and *when* internalized stigma was attributed to BMI. As body image increased so did internalized HIV stigma; however, it increased more for persons that had an ideal or underweight BMI. One caveat in interpreting these results is that well over two-thirds of participants reporting having no concerns with their shape. Black persons of color tend to hold better body images and a heavier weight status as the desired norm. The valued heavier body size may account for participants *perceptions* of their weight status, where very few persons that were measured as having obesity *actually* perceived themselves to be *very* overweight and over half of these individuals perceived themselves to be

slightly overweight. Similarly, over half of persons that were measured as being overweight perceived themselves to be *about the right* weight and a little less than half of those that were measured as having an ideal weight perceived themselves as being *slightly* or *very* underweight.

Future research is needed to fully investigate the relationship between body image, internalized HIV stigma and BMI. Overweight and obesity remain problematic in PLWH as was displayed in this study and future interventions may need to address what some black persons of color view as traditionally held weight norms and educate PLWH about potential risk factors associated with the intersection of HIV and obesity. As noted earlier, over 91% of the sample was black persons of color; additional research is needed to investigate weight status in other PLWH of color as well as white PLWH. As PLWH are approaching the life expectancy of the general population, it may be that overweight and obesity is a result of many variables combined, including environmental, structural, and others that are contributing to overweight and obesity more so than a desire to protect oneself against the stigma of being a PLWH.

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Table 1. *Demographic Characteristics by Weight Category*

	Weight Category				
	Underweight	**Ideal WT**	**Overweight**	**Obese**	
	(n=12)	(n=245)	(n=167)	(n=201)	
	n	n	n	n	*P**
Age					
Mean ± SD	54.17±21.9	46.7±9.6	46.9±9.6	46.7±8.4	.073
Gender					.001
Male	9 (2.1%)	200 (46.7%)	122 (28.5%)	97 (22.7%)	
Female	3 (1.5%)	45 (22.7%)	45 (22.7%)	105 (53.0%)	
Race					.398
White	0 (0%)	12 (37.5%)	7 (21.9%)	13 (40.6%)	
Black	11 (1.9%)	225 (39.2%)	156 (27.2%)	182 (31.7%)	
Hispanic/Latino	1 (11.1%)	5 (55.6%)	2 (22.2%)	1 (11.1%)	
Other	0 (0%)	3 (30%)	2 (20%)	5 (50%)	
Education					.110
8th grade or less	1 (5%)	8 (40%)	3 (15%)	8 (40%)	
Some high school	1 (.8%)	51 (39.5%)	32 (24.8%)	45 (45%)	
High school or equal	6 (2.8%)	93 (42.7%)	52 (23.9%)	67 (30.7%)	
Some college	3 (1.6%)	71 (36.8%)	67 (34.7%)	52 (26.9%)	
Bachelors or higher	1 (1.5%)	22 (33.3%)	13 (19.7%)	30 (45.5%)	
Employment					
Full Time	1 (2.6%)	14 (36.8%)	13 (34.2%)	10 (26.3%)	.230
Part Time	1 (1.6%)	22 (35.5%)	17 (27.4%)	22 (35.5%)	
Disability	9 (2.5%)	141 (39.1%)	85 (23.5%)	126 (34.9%)	
Unemployed	0 (0%)	63 (44.1%)	44 (30.8%)	36 (25.2%)	
Student	0 (0%)	1 (10%)	4 (36.4%)	5 27.3%)	
Other	1 (8.3%)	4 (33.3%)	4 (33.3%)	3 (25%)	

Note. Differences were assessed by Fisher's exact tests; differences in age were assessed by ANOVA.
*P-values represent differences in proportions between BMI categories.

Table 2. *Health Related Characteristics by Weight Category*

	Weight Category				
	Underweight	**Ideal WT**	**Overweight**	**Obese**	
					*P**
CD4 Count					
Mean ± SD	574 ± 260	493 ± 302	594 ± 360	654 ± 356	*P<.001*
Viral Load					.285
Detectable	0 (0%)	52 (47.7%)	26 (23.9%)	31 (28.4%)	
Undetectable	11 (2.2%)	185 (37.2%)	137 (27.6%)	164 (33%)	
Don't Know	1 (5%)	8 (40%)	4 (20%)	7 (35%)	
Taking HIV MEDs					.997
No	2 (2.2%)	37 (49.8%)	25 (25%)	29 (29%)	
Yes	10 (1.9%)	208 (39.1%)	142 (26.7%)	172 (32.3%)	
Out of HIV MEDs					
No	8 (1.7%)	185 (38.7%)	127 (26.6%)	158 (33.1%)	.669
Yes	2 (3.6%)	23 (41.8%)	15 (27.3%)	15 (27.3%)	
Hospital Visits Since HIV diagnosis					.935
0	6 (1.6%)	145 (39.7%)	93 (25.5%)	121 (33.2%)	
1	2 (2.5%)	31 (39.2%)	19 (24.1%)	27 (34.2%)	
2	1 (2%)	19 (37.3%)	15 (29.4%)	16 (31.4%)	
3	2 (4.5%)	15 (34.1%)	14 (31.8%)	13 (29.5%)	
4	0 (0%)	13(52%)	8(32%)	4(16%)	
≥5	1 (1.6%)	22 (35.5%)	18 (29%)	21 (33.9%)	
Year of HIV Diagnosis					.739
1985-1990	3 (2.4%)	57 (46%)	31 (25%)	33 (26.65)	
1991-1995	1 (.85)	47 (39.5%)	29 (24.4%)	42 (35.3%)	
1996-2010	3 (2.3%)	44 (33.8%)	39 (30%)	44 (33.8%)	
2011-2013	5 (2%)	95 (38.2%)	68 (27.3%)	81 (32.5%)	

Note. Differences were assessed by Fisher's exact tests; differences in mean CD4 count were assessed by ANOVA.
*P-values represent differences in proportions between BMI categories.

Table 3. *Correlation Matrix*

	Variables												
Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Weight Stigma													
1. Enacted													
2. Anticipated	.736**												
3. Internalized	.512**	.497**											
HIV Stigma													
4. Enacted	.541**	.479**	.389**										
5. Anticipated	.460**	.502**	.359**	.803**									
6. Internalized	.406**	.373**	.461**	.535**	.515**								
7. BSQ	.289**	.289**	.619**	.237**	.236**	.255**							
8. Body Image[a]	.125**	.054	-.017	.104**	.119**	.155**	-.147**						
9. fat (g)[b]	-.020	-.063	-.054	-.086	-.113*	-.070	-.086	.079					
10. Fruit & Veg[c]	-.059	-.049	-.130**	-.031	-.035	-.103*	-.066	.035	.183**				
11. Fiber (g)	-.037	-.083	-.123**	-.091	-.092	-.110*	-.079	.045	.264**	.724**			
12. BMI	.085*	.111**	.254**	.045	.020	.034	.485**	-.299**	-.122*	-.076	-080		
13. Weight	.068	.072	.206**	.029	.035	.028	.457**	-.277**	-.105*	-.008	-092	.855**	
MEAN	9.03	13.7	11.1	11.3	17.7	10.0	13.2	9.58	304.0	1.9	18.8	28.14	183.1
SD	4.5	6.7	5.8	5.5	8.1	5.0	7.6	4.1	40.2	.83	7.9	7.0	47.2

Note. Correlation matrix of variables included in specified models. Not all variables in correlation matrix were included in models. BSQ = body satisfaction questionnaire

[a]Additional questions used to assess body image. Additional questions were not included in models and BSQ was used alone when assessing body image.

[b]Estimated proportion of calories from fat. [c]Estimated servings of fruit and vegetables

*$p < .05$, **$p < .01$, ***$p < .001$

Table 4. *Descriptive Statistics for Simple Mediation of Anticipated HIV Stigma on BMI and Enacted HIV Stigma*

		Reported Enacted HIV Stigma	Reported Anticipated HIV Stigma
Under and Ideal weight (X = 0)	Mean	11.1	17.4
	SD	5.2	7.4
Overweight and Obese (X = 1)	Mean	11.5	18.1
	SD	5.7	8.6
	Mean	11.3	17.8
	SD	5.4	8.1

Note. Condition was based on weight category, underweight (BMI $\leq$ 18.5 kg/m^2); ideal weight (BMI =18.6-24.9 kg/m^2); overweight (BMI = 25-29.9 kg/m^2) and obese (BMI $\geq$ 30 kg/m^2).

Table 5. *Model Coefficients for Simple Mediation model of Anticipated HIV Stigma on BMI and Enacted HIV Stigma*

		Consequent									
		M (Anticipated HIV Stigma)						ϒ (Enacted HIV Stigma)			
Antecedent		Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*		Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*
X (BMI)	*a*	.68	.66	.302	-.620	1.984	*c'*	.00	.27	.994	-.531	.535
M (Anticipated HIV Stigma)		---	---	---	---	---	*b*	.53	.02	<.001	.504	.586
Constant	i_1	17.42	.50	<.001	16.427	18.427	i_2	1.8	.354	<.001	1.108	2.499
		R^2 = .002						R^2 = .632				
		F(1, 622) = 1.06, *ρ* = .302						*F*(2, 621) = 532.9, *ρ* = .000				

	Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*
ab	.366	.340	---	*-.295*	1.040
c	.368	.447	.41	*-.509*	1.245

Note. PROCESS macro was used to assess simple mediation. Confidence Intervals were calculated using 5000 iterations, resulting in a 95% interval estimate. *a* = difference between two group means on M, *b* = difference in units on ϒ for two cases that differ by one unit on M but equal on X, *c'* = direct effect of X on Y, *ab* = indirect effect of X on Y (mediation), *c* = total effect of X on Y, *i* = regression intercepts, *LLCI* = Lower level confidence interval, *ULCI* = Upper level confidence interval. Adapted from "Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach," by A. Hayes, 2013, p. 94. Copyright 2013 by The Guilford Press, New York.

Table 6. *Descriptive Statistics for Simple Mediation of Anticipated weight Stigma on BMI and weight HIV Stigma*

		Reported weight Enacted Stigma	Reported Anticipated weight Stigma
Under and Ideal weight (X = 0)	Mean	8.7	13.1
	SD	4.2	6.9
Overweight and Obese (X = 1)	Mean	9.3	14.2
	SD	4.7	6.8
	Mean	9.0	13.7
	SD	4.5	6.8

Note. Condition was based on weight category, underweight (BMI $\leq$ 18.5 kg/m^2); ideal weight (BMI =18.6-24.9 kg/m^2); overweight (BMI = 25-29.9 kg/m^2) and obese (BMI $\geq$ 30 kg/m^2)

Table 7. *Model Coefficients for Simple Mediation of Anticipated Weight Stigma on BMI and Enacted Weight Stigma*

		Consequent									
		M (Anticipated Weight Stigma)						ϒ (Enacted Weight Stigma)			
Antecedent		Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*		Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*
X (BMI)	*a*	1.031	.556	.065	-.062	2.130	*c'*	.095	.252	.705	-.130	1.310
M (Anticipated HIV Stigma)		---	---	---	---	---	*b*	.480	.018	<.001	.442	.515
Constant	i_1	13.129	.428	<.001	12.289	13.970	i_2	2.37	.306	<.001	.442	.515
		$R^2 = .005$						$R^2 = .004$				
		$F(1, 622) = 3.431$, $\rho = .302$						$F(2, 621) = 354.1$, $\rho = .000$				

	Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*
ab	.494	.276	---	*-.027*	1.051
c	.590	.3663	.108	*-.130*	1.309

Note. PROCESS macro was used to assess simple mediation. Confidence Intervals were calculated using 5000 iterations, resulting in a 95% interval estimate. *a* = difference between two group means on M, *b* = difference in units on ϒ for two cases that differ by one unit on M but equal on X, *c'* = direct effect of X on Y, *ab* = indirect effect of X on Y (mediation), *c* = total effect of X on Y, *i* = regression intercepts, *LLCI* = Lower level confidence interval, *ULCI* = Upper level confidence interval. Adapted from "Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach," by A. Hayes, 2013, p. 94. Copyright 2013 by The Guilford Press, New York.

Table 8. *Comparison of Daily Dietary Intake to USDA Recommended and Estimated intakes from U.S. Population*

	US rec[a]		US pop[b]			Sample	
			Men				
	g	*t*	*g*	*sd*	t	*g*	*sd*
Grams of Fiber	38	-52.6**	18.7	.4	-1.4	18.14	7.5
Energy From Fat	35	-3.7**	33	.3	6.2**	34.3	4.0
	srv[c]		*srv*			*srv*	
Fruit and Vegetable	5	-84.0**	2.7		-22.3**	1.86	.76
			Women				
	g	*t*	*g*	*sd*	t	*g*	*sd*
Grams of Fiber	25	-.40**	15.5	.2	.24	15.2	8.3
Energy From Fat	35	-3.5**	33	.2	1.5	33.6	5.1
	srv		*srv*			*srv*	
Fruit and Vegetable	5	-37.2**	2.7		-9.8**	1.7	.782

Note. All dietary data were self-reported. srv = serving of fruits and vegetables. Single sample t-tests were used to compare differences between our samples intake of fruit and vegetable servings, fiber (g), and percentage energy from fat (g) to recommended servings and normative data for men and women available from the United States Department of agriculture (USDA) and NHANES 2009-2010.

[a]Means and standard deviations of U.S. dietary recommendations were attained from the United States Department of Agricultural, 2010. [b]Means and standard deviation of estimated consumption of fruits and vegetables was attained from the CDC State indicator report on fruits and vegetables 2013 and estimate consumption of energy from fat and fiber were attained from the *What We Eat in America*, NHANES 2009-2010.

***P* < *.001* is statistical significant

Table 9. *Model Coefficients for Simple Mediation of Body Image on Internalized HIV stigma and BMI*

		Consequent									
		M (Body Image)						ϒ (BMI)			
Antecedent		Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*		Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*
X (Internalized HIV Stigma)	*a*	.477	.073	<.001	.333	.621	*c'*	-.130	.050	.009	-.228	-.039
M (Body Image)		---	---	---	---	---	*b*	.371	.026	<.001	.319	.422
Constant	i_1	11.841	.827	<.001	10.217	13.464	i_2	23.256	.625	<.001	22.029	24.483
		R^2 = .064						R^2 = .243				
		$F(1, 622) = 42.43$, $\rho = .000$						$F(2, 621) = 99.92$, $\rho = .000$				

	Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*
ab	.178	.034	---	*.115*	.247
c	.047	.055	.380	*-.061*	.155

Note. PROCESS macro was used to assess simple mediation. Confidence Intervals were calculated using 5000 iterations, resulting in a 95% interval estimate. *a* = two cases that differ by one unit on X, estimated difference on M, *b* = difference in units on ϒ for two cases that differ by one unit on M but equal on X, *c'* = direct effect of X on Y, *ab* = indirect effect of X on Y (mediation), *c* = total effect of X on Y, *i* = regression intercepts, *LLCI* = Lower level confidence interval, *ULCI* = Upper level confidence interval. Adapted from "Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach," by A. Hayes, 2013, p. 94. Copyright 2013 by The Guilford Press, New York.

Table 10. *Simple Moderation of Body Image and Internalized HIV Stigma by BMI*

		Coeff	*SE*	*t*	*p*
Intercept	i_1	6.548	.663	9.887	<.001
Body Image (X)	b_1	.289	.050	5.903	<.001
Condition BMI (M)	b_2	1.147	.865	.185	.1854
Body Image x BMI (XM)	b_3	-.166	.055	-3.025	.002
			$R^2 = .087$, $MSE = 23.66$		
			$F(3, 620) = 19.737$, $p < .001$		

Note. PROCESS macro was used to assess simple mediation. Confidence Intervals were calculated using 5000 iterations, resulting in a 95% interval estimate. Adapted from "Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach," by A. Hayes, 2013, p. 247. Copyright 2013 by The Guilford Press, New York.

Table 11. *Model Coefficients for Simple Mediation of Internalized Weight Stigma on BMI by Body Image*

		Consequent									
		M (Body Image)						ϒ (BMI)			
Antecedent		Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*		Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*
X (Internalized weight Stigma)	*a*	1.022	.551	<.001	.922	1.121	*c'*	-.099	.053	.062	-.204	-.005
M (Body Image)		---	---	---	---	---	*b*	.392	.033	<.001	.327	.456
Constant	i_1	5.241	.641	<.001	3.983	6.499	i_2	22.706	.551	<.001	21.622	23.787
		$R^2 = .395$						$R^2 = .293$				
		$F(1, 622) = 405.39$, $\rho = .000$						$F(2, 621) = 97.699$, $\rho = .000$				

	Coeff.	*SE*	*ρ*	*LLCI*	*ULCI*
ab	.401	.044	---	.317	.491
c	.301	.046	<.001	.211	.391

Note. PROCESS macro was used to assess simple mediation. Confidence Intervals were calculated using 5000 iterations, resulting in a 95% interval estimate. *a* = two cases that differ by one unit on X, estimated difference on M, *b* = difference in units on ϒ for two cases that differ by one unit on M but equal on X, *c'* = direct effect of X on Y, *ab* = indirect effect of X on Y (mediation), *c* = total effect of X on Y, *i* = regression intercepts, *LLCI* = Lower level confidence interval, *ULCI* = Upper level confidence interval. Adapted from "Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach," by A. Hayes, 2013, p. 94. Copyright 2013 by The Guilford Press, New York

Table 11. *Comparison of Perception of Weight Status by Actual BMI Measurement.*

	Underweight		Ideal Weight		Overweight		Obese		X^2
	N	%	N	%	N	%	N	%	
Very Underweight	5	(41.7)	21	(8.6)	1	(.6)	4	(2)	$p < .000$
Slightly Underweight	3	(25)	77	(31.4)	13	(7.8)	7	(3.5)	
About the right Weight	2	(16.7)	141	(57.6)	95	(56.9)	27	(13.4)	
Slightly Overweight	0	(0)	6	(2.4)	53	(31.7)	105	(52)	
Very Overweight	2	(16.7)	0	(0)	5	(3)	59	(29)	
Total	12	(1.9)	245	(39.1)	167	(26.7)	202	(32.3)	

Note. Fisher's Exact test was used to assess group differences.

Table 12. *Descriptive statistics for the perceptions of weight status on Body Image, Internalized, Anticipated, and Enacted HIV and Weight Stigma*

	Internalized HIV Stigma			BMI	
	M	*SD*	*P*	M	*SD*
Control (n = 37)	12.45	6.46	***	22.93	6.75
Slightly underweight (n =105)	9.71	5.01		23.20	3.74
About the right weight (n = 284)	9.58	4.80		25.39	3.66
Slightly overweight (n = 174)	10.10	5.40		32.25	5.25
Very Overweight (n = 70)	10.03	5.06		38.731	8.22
All Groups Combined	10.03	5.07		28.12	6.985
	Anticipated HIV Stigma				
Control (n = 37)	19.97	9.90	***		
Slightly underweight (n =105)	17.23	7.58			
About the right weight (n = 284)	17.37	7.70			
Slightly overweight (n = 174)	17.82	8.40			
Very Overweight (n = 70)	18.89	9.10			
All Groups Combined	17.77	8.16			
	Enacted HIV Stigma				
Control (n = 37)	12.81	6.17	***		
Slightly underweight (n =105)	11.70	5.59			
About the right weight (n = 284)	10.60	5.23			
Slightly overweight (n = 174)	11.70	5.41			
Very Overweight (n = 70)	12.02	6.16			
All Groups Combined	11.33	5.52			
	Internalized Weight Stigma				
Control (n = 37)	14.95	7.33	**		
Slightly underweight (n =105)	10.47	5.76			
About the right weight (n = 284)	8.84	3.99			
Slightly overweight (n = 174)	12.49	6.07			
Very Overweight (n = 70)	15.90	6.50			
All Groups Combined	11.12	5.88			
	Anticipated Weight Stigma				
Control (n = 37)	17.70	9.65			
Slightly underweight (n =105)	13.06	5.62			
About the right weight (n = 284)	12.62	6.34			
Slightly overweight (n = 174)	14.22	6.80			
Very Overweight (n = 70)	13.70	6.77			
	Enacted Weight Stigma				
Control (n = 37)	11.89	6.73	**		
Slightly underweight (n =105)	8.73	4.13			
About the right weight (n = 284)	8.31	3.92			
Slightly overweight (n = 174)	9.44	4.65			
Very Overweight (n = 70)	9.84	4.86			
All Groups Combined	9.02	4.51			
	Body Image				
Control (n = 37)	14.16	8.20	***		
Slightly underweight (n =105)	13.32	6.79			
About the right weight (n = 284)	12.67	6.59			
Slightly overweight (n = 174)	20.84	9.75			
Very Overweight (n = 70)	28.41	9.88			
All Groups Combined	16.62	9.57			

Note. One way ANOVA was used to asses group differences.
*$P < .05$, ** $P < .01$, ***$P < .001$

Table 13. *Model Coefficients for Multi-Categorical, Parallel Multiple Mediator Model.*

	*M (*Enacted Weight Stigma)			*Y* (BMI)				
		Coeff. *(SE)*		Coeff. *(SE)*		Coeff. *(SE)*	*LLCI*	*ULCI*
Constant	i_1	11.714*** (.9560)	i_3	18.677*** 1.209				
D_1	a_1	-3.324*** (.9251)	c_1	.445 1.006	ab_1	-.015 (.232)	-.402	.368
D_2	a_2	-3.654*** (.9251)	c_2	2.351* .9411	ab_2	-.016 .253	-.431	.400
D_3	a_3	-2.589** .8834	c_3	7.912*** .985	ab_3	-.011 (.185)	-.320	.296
D_4	a_4	-2.506 .990	c_4	13.221*** 1.135	ab_4	-.011 (.182)	-.318	.284
		$R^2 = .0364$			b_1	.005 1.209		
		$F(5,618) = 4.67$, $p = .000$						

	M (Anticipated Weight Stigma)			*Y* (BMI)				
		Coeff. *(SE)*		Coeff. *(SE)*		Coeff. *(SE)*	*LLCI*	*ULCI*
Constant	i_1	17.697*** (1.450)	i_3	18.677*** 1.209				
D_1	a_1	-5.255*** (1.402)	c_1	.445 1.006	ab_1	-.245 (.247)	-.680	.125
D_2	a_2	-5.656*** (1.296)	c_2	2.351* .9411	ab_2	-.264 (.260)	-.712	.135
D_3	a_3	-4.208** 1.339	c_3	7.912*** .985	ab_3	-.196 (.203)	-.560	.102
D_4	a_4	-3.240 (1.500)	c_4	13.221*** 1.135	ab_4	-.151 (.173)	-.465	.080
		$R^2 = .042$			b_2	.047 (.043)		
		$F(5,618) = 5.38$, $p = .000$						

Note. MEDIATE macro was used to assess simple mediation. Confidence Intervals were calculated using 5000 iterations, resulting in a 95% interval estimate. Groups were categorized as persons that identified themselves slightly underweight (D_1), about the right weight (D_2), slightly overweight (D_3), and very overweight (D_4). Persons that identified themselves as very underweight were used as the reference group. *LLCI* = Lower level confidence interval, *ULCI* = Upper level confidence interval.

Adapted from "Expert Tutorial: Statistical mediation analysis with a multicategorical independent variable," by A. Hayes & K. J. Preacher, 2014, *The British Psychological Society, 67* p. 459. Copyright 2013 by The British Psychological Society.

**$P < .01$, ***$P < .001$

Table 14. *Model Coefficients for Multi-Categorical, Parallel Multiple Mediator Model.*

	*M (*Internalized Weight Stigma)		*Y* (BMI)				
		Coeff. *(SE)*		Coeff. *(SE)*		Coeff. *(SE)*	*LLCI*	*ULCI*
Constant	i_1	14.179***	i_3	18.677***	i_2			
		(1.164)		(1.209)				
D_1	a_1	-3.930***	c_1	.445	ab_1	.377	.055	.787
		(1.123)		(1.006)		(.232)		
D_2	a_2	-5.490***	c_2	2.351*	ab_2	.525	.0860	1.039
		(1.041)		(.941)		(.296)		
D_3	a_3	-1.792	c_3	7.912***	ab_3	.172	-.012	.453
		(1.076)		(.985)		(.148)		
D_4	a_4	1.497	c_4	13.221***	ab_4	-.144	-.424	.049
		(1.021)		(1.135)		(.149)		
		$R^2 = .165$			b_3	-.096*		
		$F(5,618) = 24.47, p = .000$				(.050)		

	M (Anticipated HIV Stigma)		*Y* (BMI)				*LLCI*	*ULCI*
		Coeff. *(SE)*		Coeff. *(SE)*		Coeff. *(SE)*		
Constant	i_1	20.328***	i_3	18.677***				
		(1.752)		(1.209)				
D_1	a_1	-3.366*	c_1	.445	ab_1	.172	-.053	.506
		(1.696)		(1.006)		(.178)		
D_2	a_2	-3.101*	c_2	2.351*	ab_2	.158	-.049	.474
		(1.567)		(.941)		(.165)		
D_3	a_3	-2.780	c_3	7.912***	ab_3	.142	-.050	.439
		(1.619)		(.985)		(.157)		
D_4	a_4	-2.833	c_4	13.221***	ab_4	.145	-.058	.487
		(1.814)		(1.135)		(.169)		
		$R^2 = .007$			b_4	-.051		
		$F(5,618) = .922, p = .466$				(.041)		

Note. MEDIATE macro was used to assess simple mediation. Confidence Intervals were calculated using 5000 iterations, resulting in a 95% interval estimate. Groups were categorized as persons that identified themselves slightly underweight (D_1), about the right weight (D_2), slightly overweight (D_3), and very overweight (D_4). Persons that identified themselves as very underweight were used as the reference group. *LLCI* = Lower level confidence interval, *ULCI* = Upper level confidence interval

Adapted from "Expert Tutorial: Statistical mediation analysis with a multicategorical independent variable," by A. Hayes & K. J. Preacher, 2014, *The British Psychological Society, 67* p. 459. Copyright 2013 by The British Psychological Society.

*$P < .05$, **$P < .01$, ***$P < .001$

Table 15. *Model Coefficients for Multi-Categorical, Parallel Multiple Mediator Model.*

	*M (*Enacted HIV Stigma)			*Y* (BMI)				
		Coeff. *(SE)*		Coeff. *(SE)*		Coeff. *(SE)*	*LLCI*	*ULCI*
Constant	i_1	13.169*** (1.177)	i_3	18.677*** 1.209				
D_1	a_1	-1.427 (1.139)	c_1	.445 1.006	ab_1	-.099 (.138)	-.359	.069
D_2	a_2	-2.490* (1.053)	c_2	2.351* .9411	ab_2	-.172 (.182)	-.507	.077
D_3	a_3	-1.429 (1.088)	c_3	7.912*** .985	ab_3	-.099 (.136)	-.358	.069
D_4	a_4	-1.732 (1.219)	c_4	13.221*** 1.135	ab_4	-.120 (.156)	-.413	.073
		$R^2 = .014$			b_5	.069 (.062)		
		$F(5,618) = 1.74, p = .123$						

	M (Internalized HIV Stigma)			*Y* (BMI)				
		Coeff. *(SE)*		Coeff. *(SE)*		Coeff. *(SE)*	*LLCI*	*ULCI*
Constant	i_1	12.870*** (1.089)	i_3	18.677*** 1.209				
D_1	a_1	-2.895* (1.054)	c_1	.445 1.006	ab_1	.056 (.147)	-.182	.302
D_2	a_2	-2.859* (.974)	c_2	2.351* .9411	ab_2	.055 (.143)	-.177	.295
D_3	a_3	-2.348* (1.006)	c_3	7.912*** .985	ab_3	.047 (.121)	-.148	.254
D_4	a_4	-1.668 (1.127)	c_4	13.221*** 1.135	ab_4	.032 (.097)	-.112	.201
		$R^2 = .017$			b_6	-.019 (.062)		
		$F(5,618) = 2.18, p = .054$						

Note. MEDIATE macro was used to assess simple mediation. Confidence Intervals were calculated using 5000 iterations, resulting in a 95% interval estimate. Groups were categorized as persons that identified themselves slightly underweight (D_1), about the right weight (D_2), slightly overweight (D_3), and very overweight (D_4). Persons that identified themselves as very underweight were used as the reference group. *LLCI* = Lower level confidence interval, *ULCI* = Upper level confidence interval

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*$P < .05$, **$P < .01$, ***$P < .001$

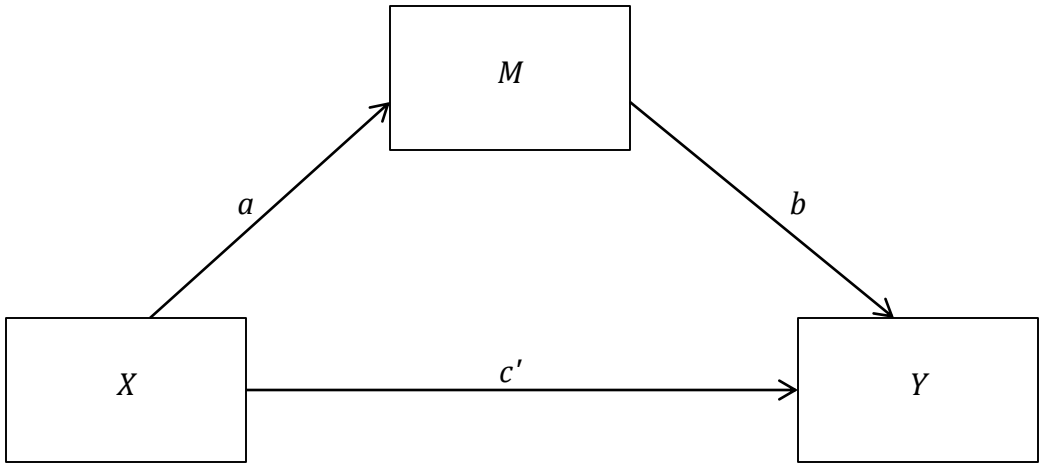
Table 16. *Model Coefficients for Multi-Categorical, Parallel Multiple Mediator Model.*

	*M (*Body Image)			*Y* (BMI)				
		Coeff. *(SE)*		Coeff. *(SE)*		Coeff. *(SE)*	*LLCI*	*ULCI*
Constant	i_1	13.511*** (1.727)	i_3	18.677*** 1.209				
D_1	a_1	-.866 (1.671)	c_1	.445 1.006	ab_1	-.115 (.230)	-.503	.256
D_2	a_2	-.925 (1.545)	c_2	2.351* .9411	ab_2	-.123 (.212)	-.486	.214
D_3	a_3	7.320*** (1.596)	c_3	7.912*** .985	ab_3	.974 (.304)	.517	1.510
D_4	a_4	14.396*** 1.788	c_4	13.221*** 1.135	ab_4	1.915 (.485)	1.170	2.760
		$R^2 = .036$			b_7	.1330*** (.448)		
	$F(5,618) = 54.47, p = .000$							

Note. MEDIATE macro was used to assess simple mediation. Confidence Intervals were calculated using 5000 iterations, resulting in a 95% interval estimate. Groups were categorized as persons that identified themselves slightly underweight (D_1), about the right weight (D_2), slightly overweight (D_3), and very overweight (D_4). Persons that identified themselves as very underweight were used as the reference group. *LLCI* = Lower level confidence interval, *ULCI* = Upper level confidence interval.

Adapted from "Expert Tutorial: Statistical mediation analysis with a multicategorical independent variable," by A. Hayes & K. J. Preacher, 2014, *The British Psychological Society, 67* p. 459. Copyright 2013 by The British Psychological Society.

*$P < .05$, **$P < .01$, ***$P < .001$



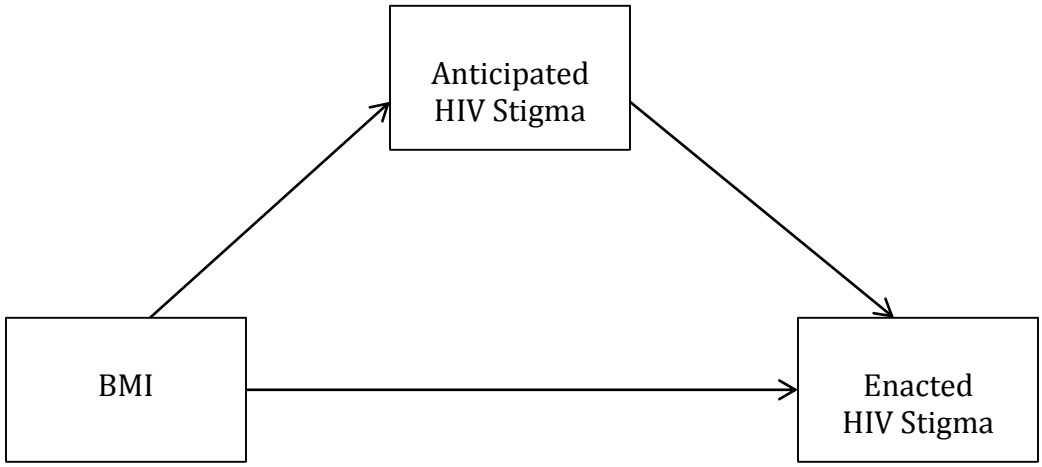
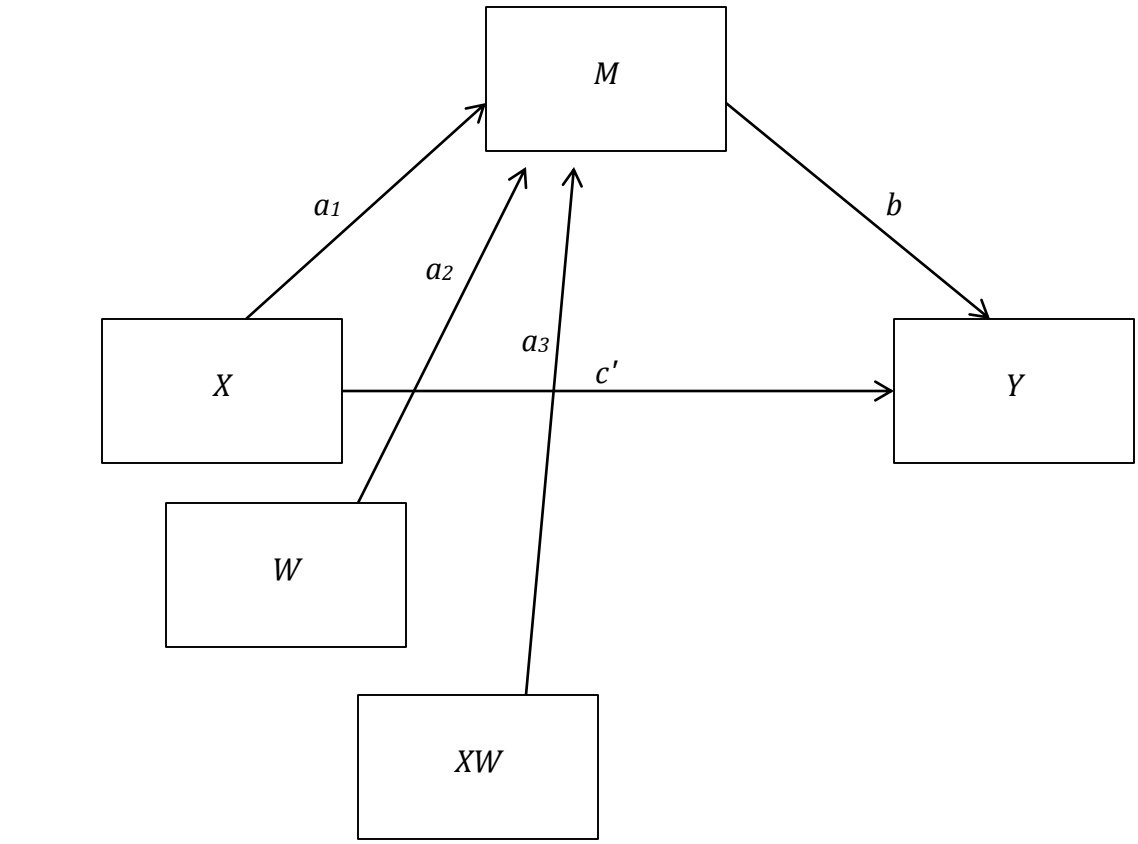


Figure 1. Simple mediated model: Effects of BMI on enacted HIV stigma mediated by anticipated HIV stigma. Adapted from "Model Templates for PROCESS for SPSS and SAS" by A. F. Hayes, model 4. Copyright 2013. http://www.afhayes.com/



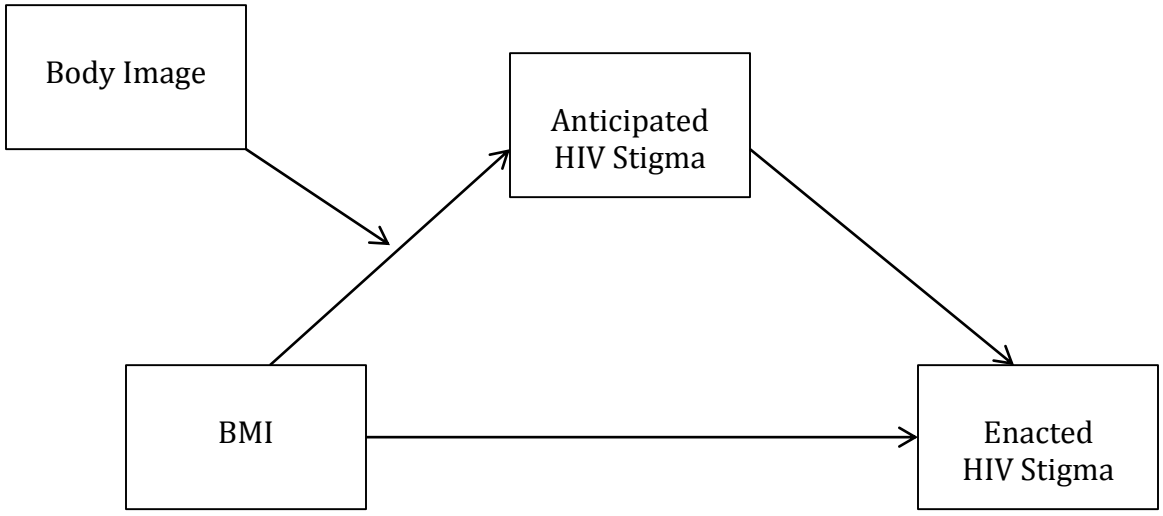


Figure 2. Moderated mediated model: Effects of BMI on enacted HIV stigma mediated by anticipated HIV stigma, upon which first leg of model is moderated by body image. Adapted from "Model Templates for PROCESS for SPSS and SAS" by A. F. Hayes, model 7. Copyright 2013. http://www.afhayes.com/

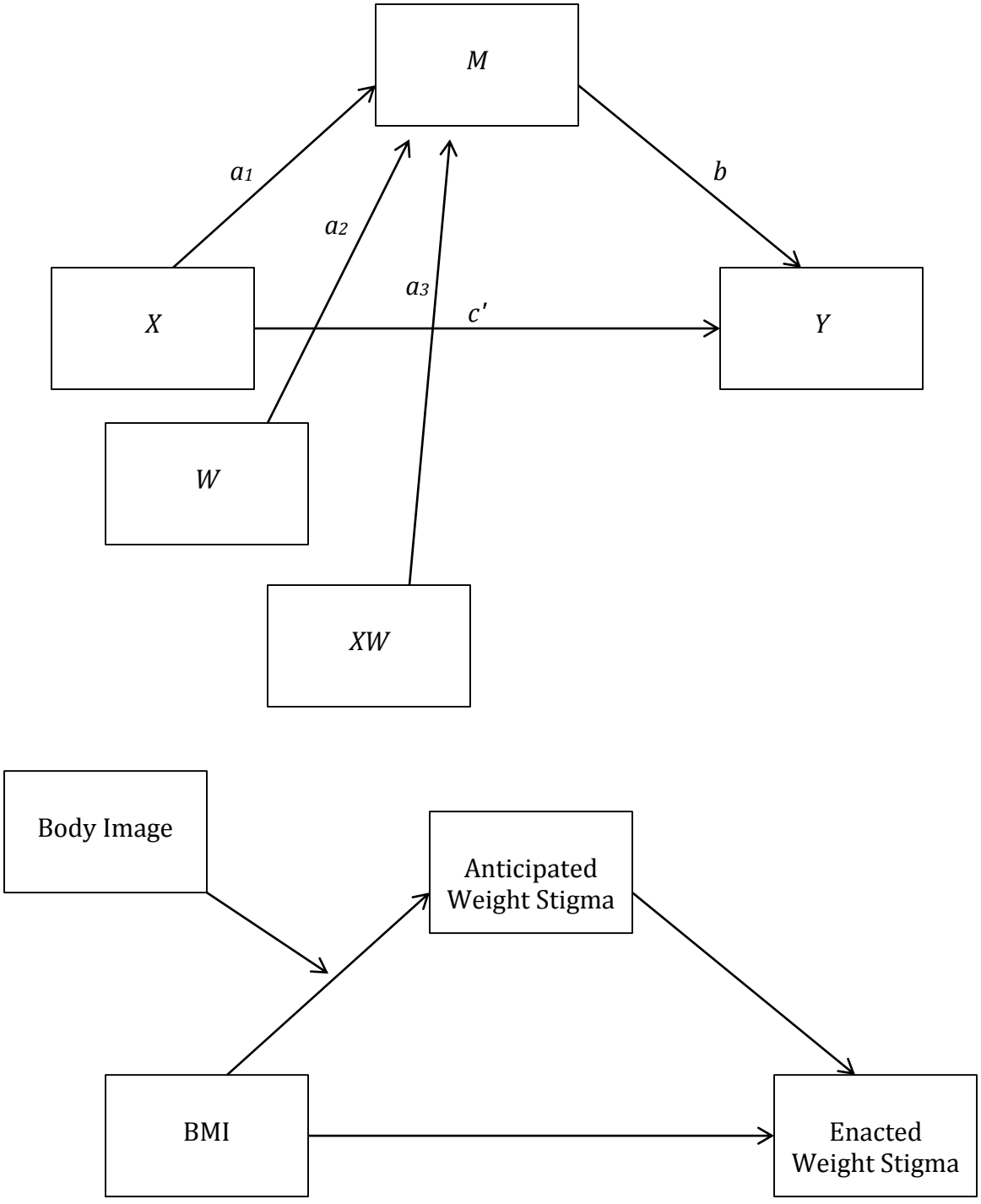
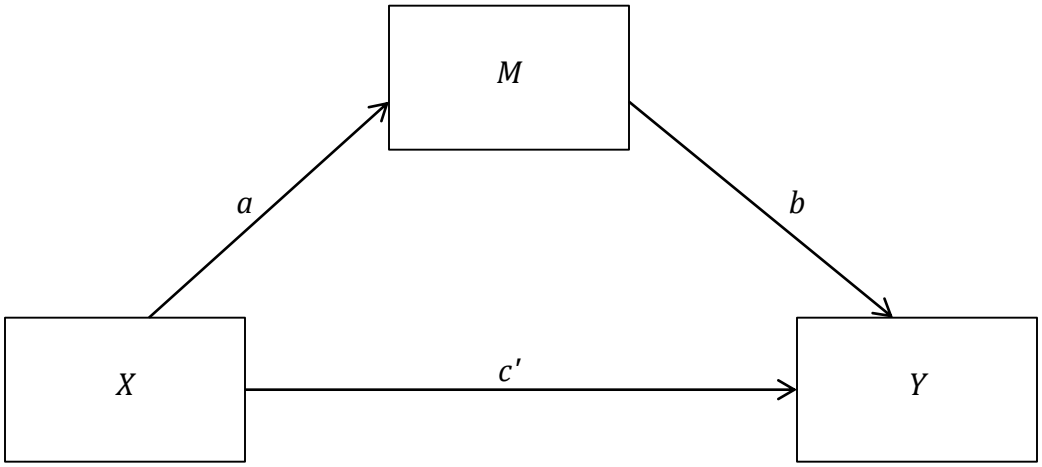


Figure 3. Moderated mediated model: Effects of BMI on enacted weight stigma mediated by anticipated weight stigma, upon which first leg of model is moderated by body image. Adapted from "Model Templates for PROCESS for SPSS and SAS" by A. F. Hayes, model 7, Copyright 2013. http://www.afhayes.com/



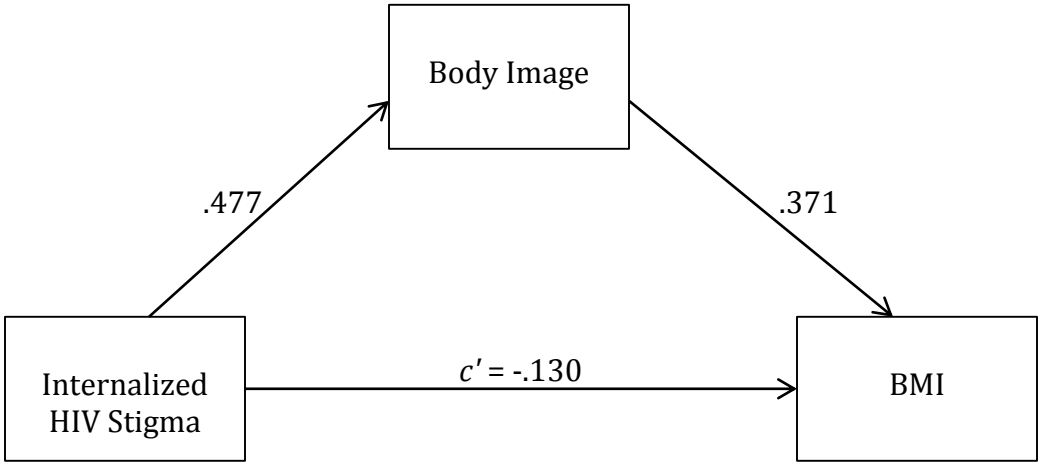


Figure 4. . Simple mediated model: Effects of internalized HIV stigma on enacted BMI mediated by body image. Adapted from "Model Templates for PROCESS for SPSS and SAS" by A. F. Hayes, model 4. Copyright 2013. http://www.afhayes.com/

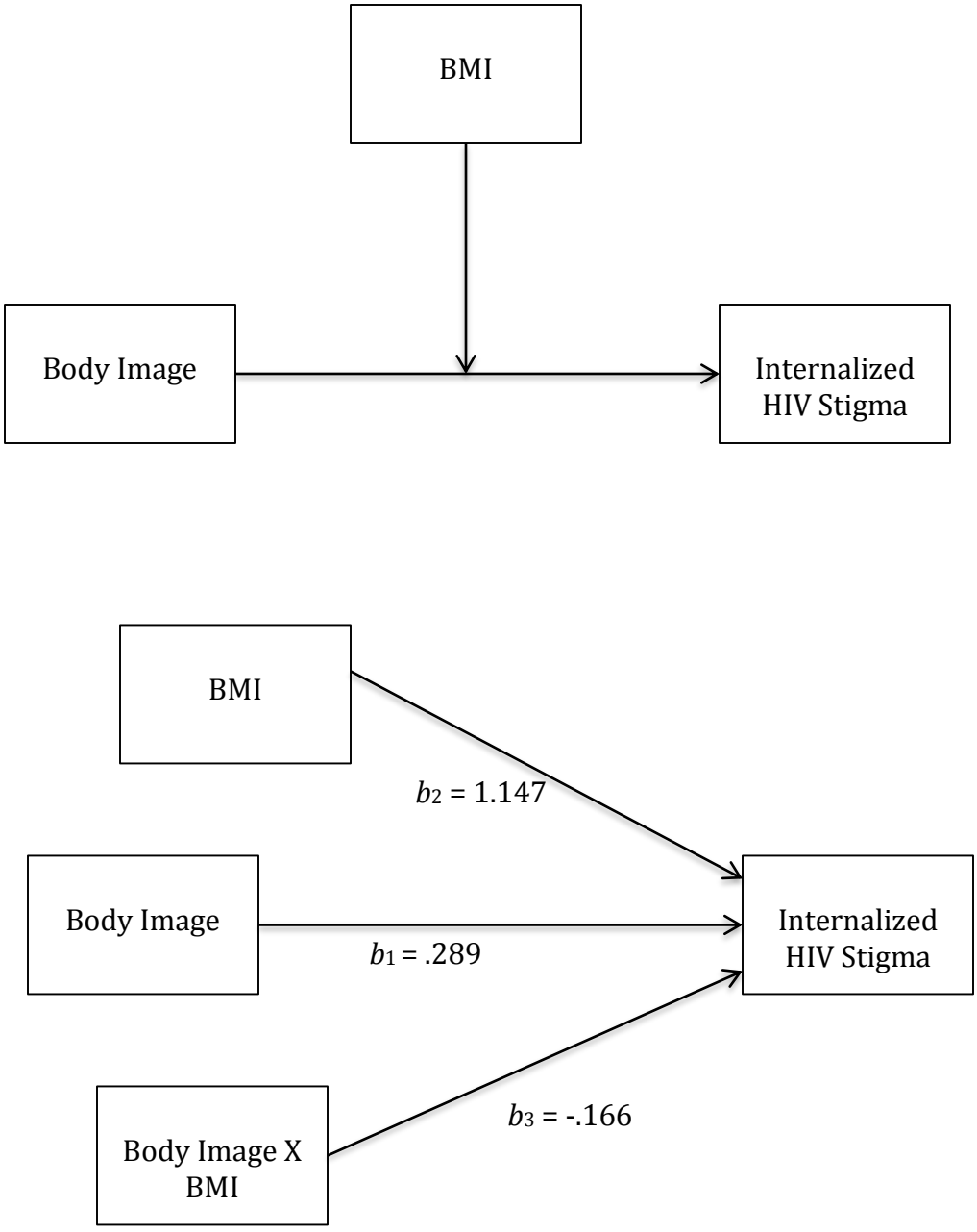


Figure 5. Moderated Model: Effects of Body Image on Internalized HIV Stigma moderated by BMI. Adapted from "Model Templates for PROCESS for SPSS and SAS" by A. F. Hayes, model 1. Copyright 2013. http://www.afhayes.com/

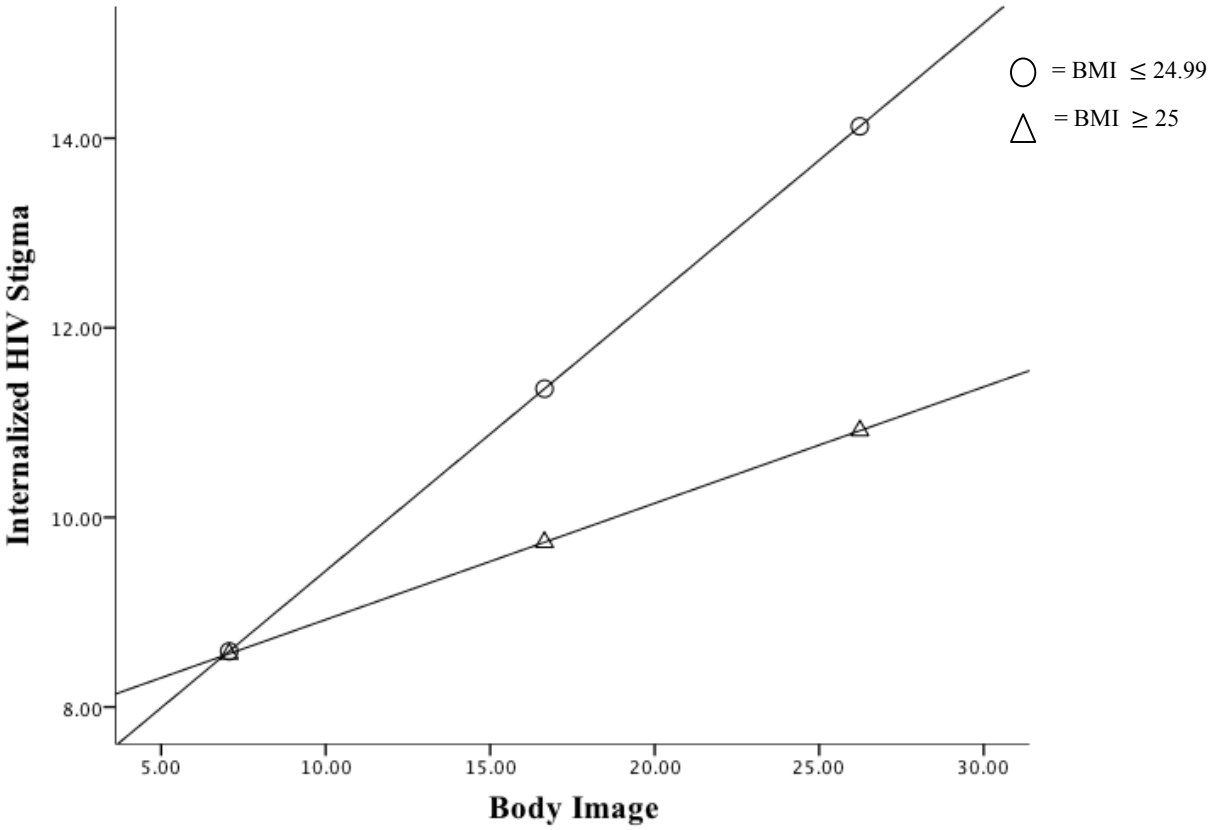


Figure 6. Moderation effect of BMI on body image and internalized weight stigma.

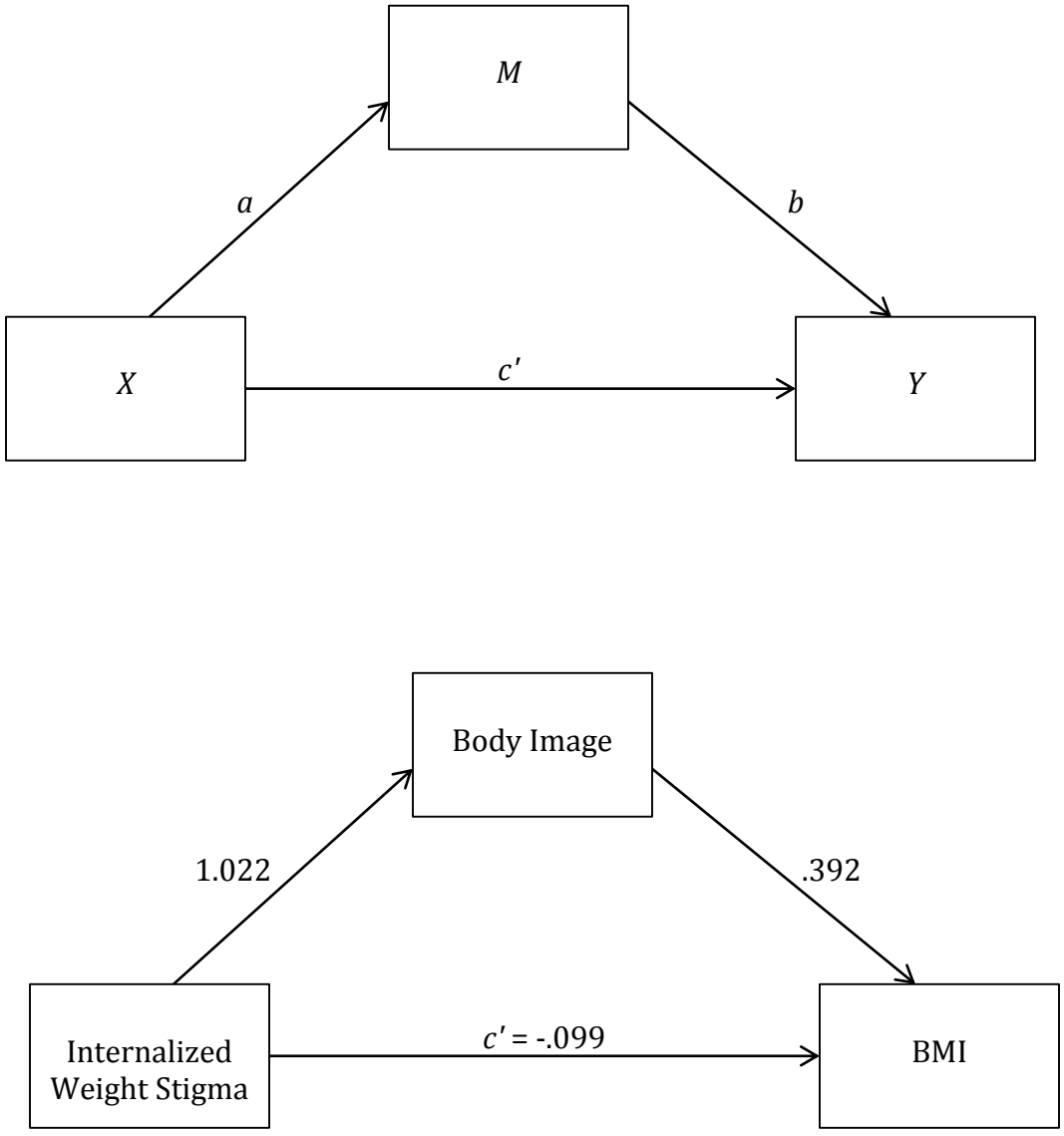


Figure 7. Simple mediated model: Effects of internalized weight stigma on enacted BMI mediated by body image. Adapted from "Model Templates for PROCESS for SPSS and SAS" by A. F. Hayes, model 4. Copyright 2013. http://www.afhayes.com/

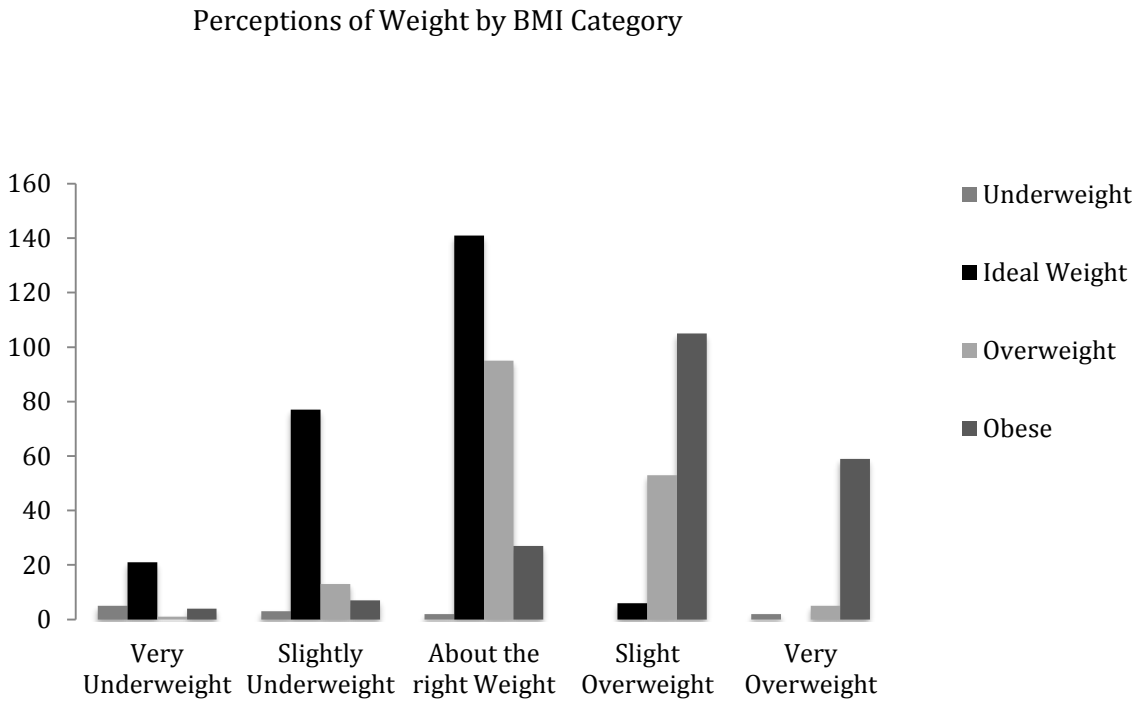


Figure 8. Cross tab distributions: reflecting perceptions of weight by BMI category.

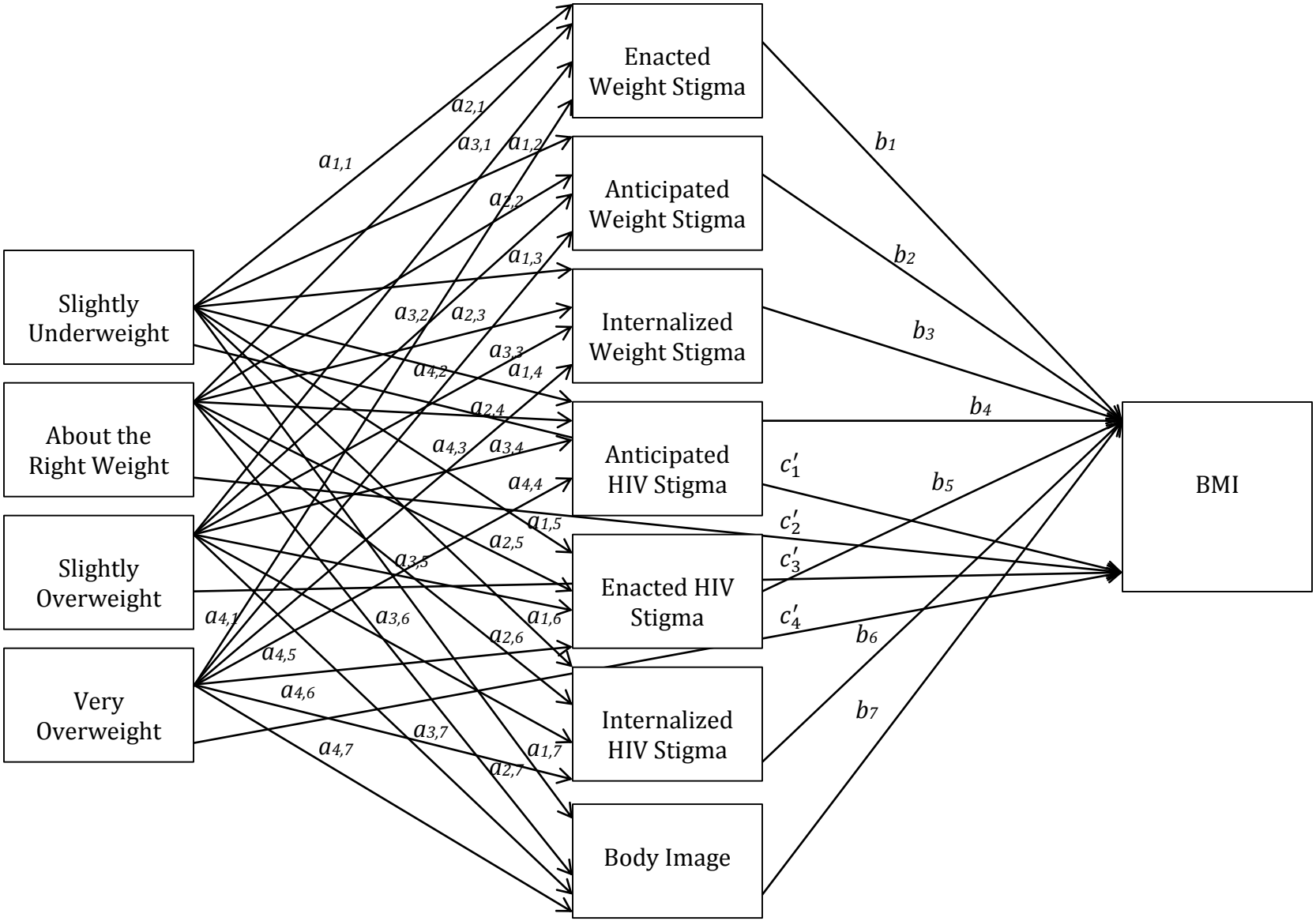


Figure 9. Multicategorical, Parallel Multiple Mediator Model.